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Role of the Armed Forces in the Formulation of India's Foreign Policy

Shri JN Dixit, IFS (Retd)

NATIONAL SECURITY SEMINAR (S-26)

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BY

SHRI JN DIXIT, IFS (RETD)

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ROLE OF THE ARMED FORCES IN THE FORMULATION OF INDIA'S FOREIGN POLICY

JN DIXIT, IFS (RETD)

I am undertaking a piquant exercise. When a career diplomat is asked to describe and analyse the role of the Armed Forces in the formulation and implementation of India's foreign policy, it is a piquant exercise because conventional wisdom dictates that a soldier takes centre-stage in inter-state relations at a point in political situations where diplomacy has failed.

German Field Marshal Von Clausewitz's aphorism "war is a continuation of policy by other means" is an oft-repeated truism. But a more existentialist and abiding reality in the fashioning of foreign policies and in the conduct of international relations is aptly expressed in the State motto of the Republic of Chile which is "Por-La-razon-O-La-Fuerza", which means first by reason and then by force. The armed forces of a country are the ultimate sanction and strength underpinning the cohesion of its civil society, the safety of its vital interests and effective orientation of its foreign policy. Therefore, it is pertinent to undertake a conceptual or theoretical description and analysis of the role of the armed forces in the fashioning of foreign relations and implementation of the foreign policy of any country.

I would begin with re-stating some well known but unpalatable realities of international relations. Inter-state relations and cycles of global orders which have characterised human history confirm that they are essentially non-moral or amoral phenomenon. One deliberately uses this description because one makes a distinction between "immorality" and "non-morality". Making this distinction is essential because this phenomenon of non-morality has been gradually

tempered by attempts by States of the world to establish an international order and patterns of international relations based on moral principles of equality, justice, fair play and cooperation to the extent possible. This pattern of evolution is reflected in transformations which have occurred in international politics from the days of conflicts and violence between politically organised societies which was the dominent characteristic of relations between them to the creation of the United Nations and the incremental codification of International Law.

Nevertheless, states and societies of the world have not yet reached levels of rational enlightenment to abide by internationally accepted legal and moral codes in furthering their respective national interests. This leads to the second abiding characteristic of international relations, the content, the equations, the relative successes or failures in inter-state relations at the most fundamental level is governed by the chemistry of power. Nurturing and safeguarding the multi-dimensional interests of civil societies organised into states, therefore, depends on their inherent power in terms of national commitment, discipline, political coherence, purposiveness, economic reserves and scientific and technological capacities.

Equally important is the political will and ability of such a civil society or state to utilise this power to resist threats to its interests and to take pre-emptive action to further these interests. In other words, to generate perceptions about effective strength and to project this strength physically when it is unavoidable and necessary. The most culminating and complete expression of this collective strength and its projection occurs through the instrumentality of the armed forces of any given country. I may confirm this realism by digressing to an anecdote of the early Greek period in history. The richest Greek of his times, Croessues once wanted to impress one of the philosophers of "Sceptic" school of Greek

thought by his wealth. He invited the philosopher to see his treasures. When Croessues asked the philosopher what he thought of the immense wealth that he (the Philosopher) had seen, the philosopher's response was: "I am deeply impressed by your vast wealth but then a thought occurs to me. I wonder whether you also have ruminated on the prospect of an individual or a group of individuals equipped with sharp and shining steel can take all this away from you within moments of their deciding to do so."

The point made by the philospher underlined the verity that regardless of the immensity of your wealth and resources, their safety depends on your having the wherewithal to protect them with necessary levels of force because the world was, and the world still is, essentially a competitive, acquisitive and compartmentalised place where keeping one's powder dry and being alert about one's safety remains necessary.

It is the collective and macro-level political expression of this requirement which resulted in creation and evolution of organised armed forces by Emperors, Kings and nation-states. Two British thinkers of Elizabethan England of the 16th Century, Hobbes and Francis Bacon, affirmed this requirement in normative terms when they endorsed the view that "Covnants without swords are but mere parchments."

The most contemporary re-affirmation of this imperative was articulated by the Secretary General of the United Nations, Kofi Annan in Baghdad in August-September 1999, after he got Saddam Hussain to sign an agreement for resumption of international inspection of Iraq's clandestine weapons of mass destruction. Kofi Annan categorically acknowledged that he could not have finalised the agreement with Saddam Hussain without the back up of US-led military power under the umbrella of the United Nations. Effective diplomacy, Annan had remarked, depends on its being backed up by necessary levels of coercive force, in existence or in terms of possibilities of operational projections.

The point I am trying to stress is that international relations and foreign policies are phenomena governed by power-equations which inevitably brings one to the conclusion that the armed forces of a country, one way or the other, profoundly influence its foreign policy. History illustrates the importance and far-reaching role that military technology and armed forces have played in inter-state relations, in the creation of empires, in the emergence of colonialism, in the rise of dangerous international phenomenon like Nazism and Fascism, as well as their fading away from the global scene. It was Babar's military failures which impelled him to move southwards from Uzbekistan to Kabul and then on to Delhi after he was defeated by his uncles and cousins in Fargana and Samarkand. It was his superior artillery and mobile light cavalry which led to the defeat of Irbrahim Lodhi in the first Battle of Panipat in 1526, laying the foundations of the Mughal empire. It was the rise of Turkish military power, blocking the land routes between Europe and Asia, which led to the creation and augmentation of the naval military technology of England and the Peninsular European powers which led to the trends of imperialism and colonialism permeating the world from the late 15th Century to the middle of 20th Century. It must also be noted that this development shifted the centre of power from Lavant to the nation-states of Peninsular Europe and England.

World history, particularly European history, between the late 16th Century to the end of the Second World War is replete with examples of nation states trying to ensure their socio-economic well-being based on a competition to control trade routes to ensure access to natural resources and goods as well as to ensure access to markets in different parts of Asia, Africa and South America. This whole process was primarily catalysed through the armed forces of these countries and their respective changing equations in terms

of military power. It is worth nothing that the profoundest origins of both the First and the Second World Wars were influenced by dissatisfaction and frustration on the part of the have-not European powers who desired greater military balance with the purpose of acquiring greater ability to match the British, the French, the Dutch and the Belgian Empires stretching from the Western littoral of Africa to the Sea of Japan in the Far East. This is admittedly a generalisation which can be substantiated in terms of specific developments and foreign policy patterns followed by different countries. These patterns needless to say were impelled and influenced by the armed forces of the countries concerned. The extent of effectiveness of their foreign policies primarily depended on factors which contributed to the strength of their armed forces.

The democratisation of the majority of nation-states in the 20th Century changed the sociological characteristics and politico-ideological orientations of the armed forces in the international community. From being primarily mercenary forces, owing loyalty to individual monarchs, leaders or oligarchies, armed forces came to identify themselves with the collectivity of nation-states and civil societies to which they belonged. This process resulted in a sociological transformation of the manpower base of the armed forces themselves. Armed forces of the world became democratised. Not just the rank and file but the officer cadres and higher command of armed forces emerged from a broad spectrum spreading across all classes of society which constituted nation states. The previous oligarchic elitist leadership of the armed forces changed with a large number of average citizens taking over the leadership of the armies of the world.

This development was the result of civil societies seeking to find representation in the military power structure of each state and secondly due to the incrementally professional and democratised methods of recruitment. Not just the ordinary ranks but highest commands in the armed forces now are

more representative of the collective interests and aspirations of the countries to which they belong. They are also more in touch with trends in public opinion and with the social and political dynamics of their societies which in turn results in their ability to contribute to the foreign and security policies of their elected governments. Even if the government concerned is not an elected one, the armed forces become supportive of such a government if it has the general endorsement of the public opinion in that country. An example of this is the consolidation of power by General Pervez Musharraf between October 1999 and September 2001 in Pakistan.

Another development which enhanced the capacity of the armed forces to influence foreign policy in operational terms is the incremental sophistication of military technologies and weapon systems. Vital foreign policy and national security decisions necessarily have to be based on sufficient knowledge about the substance and the operational strengths of one's armed forces rooted in these sophisticated technologies and weapons systems. These decisions cannot be based solely on general political considerations or rudimentary knowledge of ingredients of one's national military power. It is the professional cadres and high command of one's armed forces which can and which should provide enough of technically knowledgeable inputs to examine options and to choose from amongst these options, the right kind of policy to meet the broader strategic and political objectives in foreign and security policies as they arise within the framework of changed patterns of national interests.

The legitimacy, relevance and clout of the armed forces in democratic societies is further enhanced with majority of democratic nation states now having voluntary standing armies; except for moments of high emergency, the practice of compulsory drafting of citizens into armed forces is fading

away. There are of course stipulations of compulsory temporary military service for citizens in some countries for a period of one to two years. But they are not permanent elements in the armed forces. They are the national defence reserve. Another relevant linkage to be noted is that such military training arrangements are an inter-phase between citizens and the regular armed forces which in turn animates the role of the armed forces in advising on foreign and security policy matters.

Another factor which makes advice and assessment from the armed forces relevant to their respective governments is the incremental role of the United Nations not just in international peace keeping but in international peace-making as well as in undertaking effective pre-emptive diplomacy as articulated and recommended in the *Agenda for Peace* document adopted by the United Nations General Assembly in the early 1990s. Added to this is the phenomenon of groups of states or coalition of states undertaking joint military operations in response to critical developments affecting international peace and security. The latest examples are the operations in the former Republics of Yugoslavia, the Gulf War and the military campaign against the Taliban in Afghanistan by the US-led international coalition and endorsed by the United Nations.

I would designate this phenomenon as the multi-laterisation of the armed forces of nation-states. The justification and responsibility for the armed forces giving their assessment and advice on multilateral diplomatic initiatives in the national foreign policies of individual countries becomes not just necessary but imperative in responding to the growing pattern of collective international action on critical developments affecting peace and security at the regional and global levels.

This is the context in which one can examine the role of our armed forces in the formulation of India's foreign policy

over the last 54 years. I would first attempt a descriptive analysis of the role that the Indian armed forces have played in India's foreign relations and then move to what is necessary and what can be done for the future in terms of integrated perceptions of India's foreign policy and security interests.

The role of the Indian Armed Forces in influencing India's foreign and security polices in the initial decade and a half of India's independence from 1947 to 1962, was subject to intellectual and emotional perceptions about the Indian armed forces particularly about officer cadre of the Indian Armed Forces, amongst the leaders of the freedom movement in India. The Indian Armed Forces had functioned as a major instrumentality of the British Empire's foreign and security policies during the first four decades of the last century, particularly during the two World Wars, 1914 to 1918 and 1939 to 1945. It is equally relevant to remember that the consolidation of the British Empire in the sub-continental India and structuring the geo-strategic defence of this empire stretching from the Suez Canal in the West to the Straits of Malacca and the South China Sea in the East was ensured basically through British Indian Armed Forces.

From the late 20s and mid-30s of the last century onwards Indian Armed Forces started having a mixed officer cadre of the British and Indian Army officers. In the initial period, Indian officers were trained at the Sandhurst Military Academy in England till the Indian Military Academy was established in Dehra Dun, primarily to train Indian officers for the British Indian Army.

The Government of Free India perceived the senior echelons of the Indian Army as steeped in the British Colonial tradition and values. The rank and file of the Indian Armed Forces were considered emotionally and functionally committed to the British Empire by the leadership of the

Indian National Congress, the party which formed the Government of free India under the leadership of Jawaharlal Nehru. Sociologically also the Indian officers of the British Indian Army came from sections of the elitist, upper middle class background of the Indian society, which was not too involved with the freedom struggle. In contrast the leadership of the Indian National Congress and even other political parties though coming from the elitist background themselves had progressively identified themselves with the Indian masses and had consciously adopted an egalitarian orientation to be part of the life of the common people of India. The foremost and successful practitioner of this approach was Mahatma Gandhi.

The general perception about the Indian Armed Forces in the minds of the Indian leaders was that of their not being too committed to the freedom of India and of their being politically and socially distant from the common people of India. The result was social, political and psychological distances characterising the relations between the political leadership of the Government of India and the military leadership of free India in the initial years of our independence. A process had, however, begun eroding this mindset of the political class. The more perceptive leading figures of our National Movement were conscious that one of the main reasons leading to the withdrawal of the British from India was that they were not confident any more about the loyalty and commitment of the Indian personnel of the British Indian Armed Forces. The establishment of the Indian National Army by Colonel Mohan Singh and Netaji Subhash Chandra Bose consisting of jawans and officers of the British Indian Army campaigning in South East Asia during the Second World War and the mutiny of Indian Naval Ratings in Bombay in the immediate aftermath of the Second World War made a dramatic impact on the political will of the British Government to remain in India.

Nehru and Patel took cognissance of these phenomenon. This was the main reason that they did not listen to the advice given by their radical colleagues in the Congress Party that the entire Indian officers cadre of our Armed Forces and our Civil Services should be removed and that they should be replaced by ideologically committed political cadres. The Government of free India decided to retain the officer cadre of the Indian Army because of their professional qualifications and the experience they had acquired by participating in military operations of the British Empire culminating in the Second World War.

This decision, however, did not succeed in changing the basic psychological perceptions and emotional attitudes of our Government and leadership towards our Military High Command.

Another factor contributing to this approach of distances and reticences was the fact that the Commanders-in-Chief of the Indian Army and the Air Force during the first two to five years were British Officers. Lord Mountbatten, himself a Naval Officer, insisted on remaining the Chief of the Cabinet Committee on Defence. Field Marshal Lord Auchinleck, British Commander-in-Chief of unpartitioned India, presided over the division of the Indian Armed Forces between Pakistan and India. The first two Commanders-in-Chief of India were General Lockhart and General Bucher. The manner in which Mountbatten, Lockhart and Bucher dealt with the first foreign policy and security crisis that India faced, namely, the Pakistani invasion of Jammu and Kashmir in 1947, only heightened Nehru and Patel's doubt about the Indian Armed Forces. These three British officers not just advised but bulldozed decisions, against the wishes of Nehru and Patel, which resulted in India losing one-third territory of the State of Jammu and Kashmir to Pakistan. Recently revealed records show that Nehru and Patel had taken the view by December 1947 -January 1948 that the Indian Army should launch

military operations against Pakistan, exercising relevant strategic options to ensure Pakistan's withdrawal from Jammu and Kashmir. Mountbatten vetoed this advice as Chairman of the Defence Council. It was he who gave the basic advice to Nehru to go to the United Nations, and to offer a plebiscite, with the general assurance that the British Government in combination with the United States would initiate effective action through the United Nations, leading to Pakistan's complete withdrawal from the state of Jammu and Kashmir. The inputs received from Major General Kulwant Singh commanding forces in Jammu and Kashmir and from Generals Thimayya and Cariappa in the high military echelons of the Western Command nevertheless made Nehru insist that while the political option of going to the UN was being exercised, India should simultaneously plan for a military campaign against Pakistan to ensure vacation of aggression in Jammu and Kashmir. Such orders were given to the Commander-in-Chief of the Indian Army. General Lockhart insisted with Nehru that it would not be possible to expel Pakistan-sponsored raiders from the Jhelum Valley till the Spring of 1948. Lockhart's successor Bucher soft-paddled the orders of Nehru to prepare to launch military operation against Pakistan. He confided to the United States Charge d'Affaires in January 1948 that he had taken no steps to prepare the Indian Army for a cross-border operation. He pointed out that the Attlee Government on the advice of Mountbatten had cautioned Nehru against launching any military operation.

Meanwhile, the UN Security Council was activated pro-forma, which was used as an excuse by Bucher to ignore Nehru's orders. It was only the clarity of purpose and innovative initiatives of Generals Cariappa, Thimayya and Kulwant Singh which resulted in the successes of the limited operations which they were allowed to undertake in Jammu and Kashmir itself, despite the machinations of the British

officers positioned in the power structure of free Government of India. It is pertinent to note that the field commanders Thimayya and Kulwant Singh not only operated effectively in military terms but their political advice was against India going to the UN before the operations were completed recovering the whole territory of the state of Jammu and Kashmir. This advice was not heeded by Nehru though as early as in December 1947, he had felt that going to the UN might not have been an exercise serving India's vital interests.

The period between 1948 and 1962 was a period of negative experiences in interaction between the political leadership of the Government of India and the professional leadership of the Indian Armed Forces. The experience of the first and Second World Wars and the colonial wars waged by various European powers in Asia and Africa had left Nehru with an aversion regarding the use of military force to manage political and strategic affairs. He genuinely believed that the Armed Forces of India should go into operations only in a defensive framework. He somehow was not a believer in pre-emptive action which was the constant and repeated advice rendered to him by senior Indian officers of the Army like General Cariappa, General Srinagesh, General Thimayya, General Rajendrasinghji, General Thorat and so on. Nehru also believed that by not joining power blocs, or being part of alliances with the important powers but giving priority to political negotiations in a principled manner, would stabilise India's foreign relations and safeguard its national security interests. The consequence was insufficient financial and material resources being allocated for defence purposes. Also disappointing was his nomination of comparatively light weight political leaders like Sardar Baldev Singh and Sir Gopalaswamy Aiyangar as India's first Defence Ministers. They were eminent and thoughtful individuals, but they did not have strategic vision about India's defence and foreign policy requirements. Nor did they have much experience in perceiving the normative terms

of reference of India's foreign policy and defence arrangements. Professional leadership of the Armed Forces therefore did not have the advantage of a positive political catalyst to communicate their advice to the Prime Minister or to the Indian cabinet.

The first influential political personality to hold the portfolio of Defence in the Indian cabinet was Mr VK Krishna Menon. The ideological parallelism in the orientations of Nehru and Menon in matters related to Defence and external relations was clearly visible. Menon was a negative and constrictive influence on the advice flowing from the Indian Armed Forces High Command to the Government's leadership. His patriotism and commitment to India and his vision of making India prominent in international affairs and self-reliant in its defence capacities were, however, hampered by his prejudices against the professional High Command of the Indian Armed Forces. He nurtured an ideological suspicion about the mindset of our senior commanders who he thought were steeped not only in British traditions but British imperial motivations. His long stay in England and struggle against the British rule in India, had created in him an antagonism towards the UK and its allies which permeated his attitude towards his own senior military advisors. He somehow was not willing to accept that the Army High Command of India was apolitical, deeply committed to India's freedom and security and that the advice rendered to him would be professional and objective. He played favourites in manning the senior positions of the Indian Army. He stiffled dissent and independent advice from the Armed Forces. Suffice it to mention that tension between him and the Indian Armed Forces High Command reached a threshold where the Army Chief General Thimayya offered his resignation and had to be persuaded personally by Nehru with great difficulty to withdraw his resignation.

There is no need for me to mention names of other

military figures who became part of the controversies during Krishna Menon's tenure as Defence Minister of India while he was simultaneously playing the role of Foreign Minister of India in diplomatic terms because Nehru was himself the Prime Minister. Krishna Menon rejected the valid advice given by the Indian Army High Command that in the structuring of India's foreign policy, India should pay equal attention to the potential threats posed to her security by both Pakistan and China. The correct assessment given by our Army High Command that given India's nonaligned posture in foreign policy, which had created distances with the US and its allies and given the Cold War equations between Soviet Union and China, India's leverages were limited against potential Chinese threats particularly after the Chinese expansion into Tibet and our accepting this expansion due to the ideological orientations of Nehru's foreign policy.

I would mention in passing that Sardar Vallabh Bhai Patel had asked Nehru in writing to negotiate definite quid pro quos from China settling the Sino-Indian boundary before accepting Chinese sovereignty over Tibet, an advice which was backed up by our Army High Command. Krishna Menon was convinced that China was not a threat and that Pakistan was the only threat which India had to face, a threat which India could effectively deal with. This major security and strategic miscalculation by India was the result of our government ignoring professional assessment made by our Armed Forces High Command. It is equally interesting to note that while the seniormost foreign office officers at that time accepted the Nehru-Krishna Menon line on threat perception from China, the middle echelons of the Indian foreign office had agreed with the assessment given by the Indian Armed Forces, but they were over-ruled and the advice from the Armed Forces was ignored.

I claim some personal knowledge about this matter as I

was Under Secretary in charge of China in the period immediately preceding and the period during the Sino-Indian War of 1962.

Krishna Menon's positioning officers with doubtful professional competence who acquiesced to his views on foreign policy and Defence was another reason for the debacle which India suffered in 1962.

When it became clear between 1959 and 1961 that China was not going to relent in its policy of territorial expansion against India, these officers favoured by Krishna Menon gave the advice to follow an assertive military policy against China. This advice was underpinned by a political and militarily inaccurate view that the Indian Armed Forces could take on and defeat the Chinese Army. The argument put forward by these military officers was that Indian Army officers have interacted with Chinese Armed Forces personnel during the Second World War and were found to be no match to the professional Indian soldier. The point missed in this advice was that the Indian Armed Forces were dealing with Kuomintang Army which was demoralised after facing the Japanese Army, after functioning under the tutelage of the American military establishment and having faced the ideologically committed and militarily disciplined Chinese communist movement.

These advisors did not even take into account the elementary logistical requirements to fight the Chinese in mountainous territory stretching from Aksai Chin in the west to Tawang in the East. The result was Nehru's announcement rooted in this inaccurate military assessment ordering the Indian Army to throw out the Chinese all along the Sino-Indian border. The consequence was military defeat and the loss of political credibility which we are still recovering from.

The defeat of the Indian Armed Forces in 1962, was a watershed in the interaction between our Armed Forces and

our foreign policy establishment, both at the civil service and political levels. The ramifications were positive. Though they came out of a tragic and traumatic experience of India. The period between 1962 till date, has witnessed a gradual but incremental role of India's Armed Forces in the formulation of our assessments and the fashioning of our foreign policy till date.

Two points must be mentioned in parenthesis regarding this period about interaction between the military establishment and the civilian government of India. The first point is not openly acknowledged even now, which was that the higher echelons of the Indian Army did not have much respect or empathy for the political leadership except for very senior leaders like Jawaharlal Nehru and Sardar Vallabhbhai Patel. There was a general attitude of scepticism even disdain, about "civilians", those using Gandhi Cap or even his attire. The second point, which still is not clear is as to why the higher command of the armed forces did not insist that the Central Government deploy the Indian Air Force against advancing Chinese troops in 1962 after the fall of Walong and Se-La. I say this because the Chinese Division of the Ministry of External Affairs had recommended air strikes as soon as Walong fell. On orders from my deputy secretary - my immediate superior AP Venkatesan, I remember preparing the basic note giving this advice. But the advice was overruled at higher levels. I do not know whether the overruling was done on grounds of political or military apprehensions. Perhaps the Henderson Brooks report on the 1962 Campaign will clarify this point.

I still feel that not using our air force against the Chinese at that time was a mistake because at that point of time they did not have the necessary logistical facilities in Tibet to undertake an effective air operation against India.

Our military defeat in 1962 brought about a fundamental change in the Government of India' s philosophy as well as

policies regarding India's security and defence. The defeat also brought home the need to temper the ideological orientations of India's foreign policy with an objective assessment of politico-strategic realities and threat perceptions. The going of Defence Minister Krishna Menon facilitated the appointment of professional and apolitical officers in the highest echeclons of the Indian Armed Forces. The Intelligence Directorates of the three Armed Services as well as Directorates dealing with Defence procurement in the Armed Forces Headquarters commenced giving inputs in terms of political and strategic assessments as well as the needs regarding the defence supplies and weapons systems to the Defence Ministry and to the Cabinet. A Joint Intelligence Committee was formed in the immediate aftermath of the 1962 War. So was a Central Research and Policy Division created in the Ministry of External Affairs.

A process of co-ordination between the Ministries of External Affairs and Defence, and the Defence Headquarters began, which has evolved over the years and is getting gradually institutionalised.

The Chinese nuclear test of 1964 was another significant turning point in this process of coordination and consultation. In fact, from 1963 onwards, the Indian Military High Command in consultation with the then Chairman of the Atomic Energy Commission, Dr Homi Bhabha, had advised that India should anticipate Chinese nuclear weaponisation and must itself embark on infrastructural technological preparations to meet the potential Chinese nuclear challenge. It was Jawaharlal Nehru, while agreeing with this basic advice, who insisted on gradualness of approach in this respect because of his profound opposition to weapons of mass destruction.

The War with Pakistan in 1965 was an event which made the role of the Armed Forces more active in the formulation of India's strategic and foreign policies. It was the advice

given by the Armed Forces High Command which resulted in Prime Minister Lal Bahadur Shastri's decision to move away from the military and foreign policy doctrines followed by India since independence, that we shall be basically reactive and engage in conflict only in areas where the conflict has been created by the aggressor. For the first time India adopted the doctrine of pre-emptive and alternate options, neutralising the predication on which Pakistan attacked Jammu and Kashmir in 1965, namely that India will only fight in theatres pre-determined by Pakistan.

The Indian Armed Forces advancing into Pakistan across the international border outside Jammu and Kashmir was a decisive surprise, to the Pakistanis. The success of our campaign, both military and diplomatic, in 1965, was the result of the advice from our Armed Forces High Command and the co-ordination between the newly set up institutional arrangements to make assessments and determine options in terms of defence strategy and foreign policy.

That the phenomenon of incremental inputs from the Armed Forces had become an important factor for India's policy formulations was proved again in the War of liberation of Bangladesh in 1971. Prime Minister Indira Gandhi was inclined to commence military operations against Pakistan by the end of May 1971, faced with the predicament of massive inflow of refugees from East Pakistan into India. It was General, and later Field Marshal, Sam Manekshaw, who advised patience and preparations primarily in military terms. He also pointed out that the time so gained between May and November-December 1971 could be utilised by India to prepare the diplomatic ground and world opinion to accept the legitimacy of the military initiative which India was planning to take. Mrs Indira Gandhi accepted this advice leading to one of the most successful phases of India' s foreign and defence policies.

India's first nuclear test at Pokhran in 1974 was also

based on opinions and assessments given by our Armed Forces intelligence agencies and civil intelligence agencies in coordination with each other. It is they who informed the political leadership about Zulfiqar Ali Bhutto initiating a policy for Pakistan's nuclear weaponisation in March 1972 and advised that India should signal her being aware of Pakistan's plans and her capability to counter this potential threat in nuclear technological terms. One notes with some regret that while the Indian Armed Forces were involved in the basic or fundamental advisory processes in this respect, they have not been part of decision-making processes regarding nuclear weaponisation policies which were primarily handled by the civilian side, the Department of Atomic Energy, the Department of Space and Defence Research and Development Organisation. Had the Government of India taken our Armed Forces High Command into confidence on a continuous basis in the evolution of our missile and nuclear weaponisation policies some of the uncertainties, ambiguities, even lacunae in our national Defence doctrine and the diplomatic projection of our policies in this regard could have been avoided. Our armed forces have played an important role in India's multi-lateral diplomacy particularly in respect of international conflict management, peace-keeping, and peace-making operations. The Indian Armed Forces have been performing an active and effective role in these operations under the umbrella of the United Nations since 1958. They were a major component of the UN Peace Keeping Forces in Lebanon, the Middle East, Congo, Cyprus, Cambodia, Somalia, Mozambique, Rwanda, Angola and in Sierra Leone. One can not forget the role of the Indian Armed Forces during and after the War in Korea between 1950 and 1953, and in the political management of the countries of Indo-China after the French withdrawal from the region consequent to the defeat of the French Armies at Dien Bien Phu. The impact of the Indian Armed Forces through these operations had three

ramifications. First, it affirmed the commitment of India to the ideals and objectives of the United Nations. Second, it established India's credibility as an impartial implementor of the UN policies to bring about peace and stability in conflict situations and, the third, it exposed the Indian military establishment to the experiences and the inter-play between foreign policy and military factors which affected international relations in critical situations.

Over the years our Armed Forces High Command has been incrementally interested in such international missions which at times may not be entirely conducive to India's interests. Two examples which come to mind, where I have personal knowledge of our Armed Forces overruling the advice given by the Ministry of External Affairs, were the deployment of the Indian Armed Forces in Somalia and Sierra Leone. Another case falling in this category was of the MEA not being enthusiastic to depute a senior Indian Army officer to command the UN peace-keeping forces in Yugoslavia when it was breaking up. In all the three cases the Army High Command's advice prevailed over the advice given by the MEA. These were not happy experiences for the Indian Army or India' s foreign policy. It is my view that these dichotomies occurred because of the lack of continuous and institutional consultations between the Armed Forces and the Defence Ministry on the one hand, and the Ministry of External Affairs on the other. A continuous interaction facilitates integrated processes of cognition and perception about political and strategic developments which could then reduce the likelihood of compartmentalised or contradictory advice filtering to higher levels of political decision making. There have been occasions when the Indian Armed Forces High Command has tended to tailor their advice to the political inclinations and orientations of the government, which then results in failures and embarrassment to India. The most glaring example of this was the deputation of the Indian

Peace-Keeping Forces (IPKF) to Srilanka. The relevant branches of the Indian Armed Forces trained Srilankan Tamil militants on the instructions of Mrs Gandhi. The Indian Army High Command did not give objective advice to Prime Minister Rajiv Gandhi about the implications of sending a peace keeping force to Srilanka even if the macro-level political objectives of Rajiv Gandhi's Srilanka policies were legitimate and in national interest. The advice given to Rajiv Gandhi by the Indian Army High Command was that once the Tamil militants had endorsed the Indo-Srilankan Agreement of 1987, there was very little likelihood of a conflict occuring between the IKPF and the Tamil militants. Even more inaccurate was the advice tendered that in case of a conflict our armed forces could overcome the militants in a very short period. The time-frame given was of a fortnight to three weeks. I was present when this advice was given to Rajiv Gandhi. The rest is history. I must, however, add in defence of our peace-keeping forces in Srilanka that despite the wrong politico-strategic assessments mentioned above, our armed forces functioned admirably and efficiently, overcoming several handicaps. They would have succeeded in their mission and fulfilled the political objectives of Rajiv Gandhi's Srilanka policy had not Rajiv Gandhi lost power and had not the Government succeeding his government decided to abruptly withdraw the IPKF resulting in the continuous violence and tension from which Srilanka still suffers.

I must also state that as the role of Indian Armed Forces increases in India's foreign and defence policy formulations, such aberrations can occur off and on. This is unavoidable but each experience carries with it lessons for the future.

What then is the current situation regarding the role of the armed forces in India' s foreign policy? What are the requirements to make this role effective, though there is an undercurrent of dissatisfaction in our armed forces

establishment about not being allowed a sufficiently active and participatory role in formulation of strategies and foreign policies? The fact is that this role is being progressively acknowledged and is increasing. Secondly, the institutional infrastructure ensuring such a role for the Indian Armed Forces has been established and is evolving in operational terms though in a very gradual manner.

The creation of the three-tier National Security Council consisting of the Council itself at the cabinet level, the establishment of the Strategic Policy Group of which the three Services Chiefs are members, the creation of the post of National Security Advisor and that of National Security Advisory Board provide the institutional framework for a greater role for the Armed Forces in fashioning India's foreign and security policies.

There is representation of the Armed Forces in the Secretariat of the National Security Council. Since 1991-92, officers from the Ministry of External Affairs have been on deputation with our Ministry of Defence. Officers from the Indian Armed Forces have been part of Indian negotiating teams on important foreign policy issues like managing of consequences of Operation Brass Tacks, to find a practical compromise on the Siachin issue with Pakistan and in finalising the agreement for maintenance of peace and tranquility on the Line of Actual Control between India and China. Recommendations from the National Security Advisory Board and its task forces on structuring the command and control systems of our nuclear and missile weapon systems, on the integration of the Defence Ministry and the Armed Forces Headquarters, posting of armed forces personnel in ministries of External, Home and civilian intelligence agencies will contribute to the Armed Forces playing an important role in the formulation of India's foreign policy. Officers from the Indian Foreign Service and the Indian Administrative Service joining the faculties and

student bodies of the Indian Defence training institutions create a human resource basis for fruitful interaction between the Armed Forces and concerned civilian departments, of the Government. I, however, feel that these processes are slow and a bit too gradual. Inter-Services rivalries and inter-Ministerial jurisdictional concerns are slowing down the implementation of the initiatives which I have mentioned above. It is time that all concerned rise above these narrower considerations and move forward on the integration of the civilian and military entities responsible for India's security and foreign policies. I must also be candid in mentioning a psychological and intellectual aberration affecting the role of the Indian Armed Forces and the Indian civilian establishment in structuring our foreign policy. In my career as a foreign service officer, due to some coincidences, I have had the privilege of interacting with my colleagues in the Indian Armed Forces at different levels. Even after retirement this interaction continues due to my academic and journalistic work. What I have noticed is a certain disdain and scepticism in the Indian Armed Forces establishment about the discipline, the efficiency and the intellectual capacities of the civil services. A matter of even greater concern is the feeling in our armed forces that civilians do not have the same motivation and commitment to India's national interests. The civilians on the other side feel that the orientation of the armed forces is jingoistic., not sufficiently measured and calculated, not sufficiently thoughtful in assessing the broader implications of foreign policy and security options in strategic and political terms. There is also a deep seated concern about regimented and authoritarian culture of the Armed Forces. Such attitudes exist in all civil societies. I hope I am wrong but I feel that the phenomenon permeates us in a more virulent form – from the level of ordinary exchanges between military and civilian personnel to the higher level institutional, political and procedural consultation processes.

I blame this aberration on the compartmentalisation of the military and civilian establishments of the Government of India on foreign policy and defence matters. While at the operational and professional levels each necessarily has to function in different spheres, at the higher levels of policy making this compartmentalisation should be done away with.

Apart from integration of the Defence Ministry with Armed Forces Headquarters, I feel that armed forces officers should be posted in the Ministry of External Affairs. Having service attachés at Embassies is not enough. I also feel that officers of the Indian Foreign Service and Officers from our Home Ministry should be deputed not only to the Defence Ministry but also to the DRDO and to the Armed Forces Command Headquarters from the level of Corps Headquarters and above and their equivalent commands in the Navy and the Air Forces. Working together within the framework of differing environments and functional responsibilities apart from developing human contacts will create an integrated approach on strategic and political issues. Such an arrangement will create an intra-structural and institutional framework leading to cohesive advice being given to the Government at the political level. Such an arrangement could also create patterns of functional and operational understanding on foreign policy and defence issues, and will also create institutional memory facilitating collective recall of past experiences to deal with future challenges.

Being a democracy and having the largest standing army consisting of voluntary recruits, there could, and should, be no distances between India's civil society and its armed forces. This to my mind is both a philosophical and functional imperative to ensure the formulation of an effective foreign policy and for structuring an effective national security system.

Fifty years as an independent country is not too long a period for us to indulge in desperate and critical value-judgements. Our armed forces have had a creditable and efficient record in safeguarding our national interests. They are coming into their own in contributing to higher levels of policy making. That the Indian Armed Forces visualise an active role in the structuring of India's foreign relations was aptly summed up by the first Indian Commander-in-Chief of the Indian Army, Field Marshal KM Cariappa, who stated on assuming charge nearly 53 years ago that his objective was to ensure that India "has peace with strength". Creating an environment of peace underpinned by required levels of strength is the most fundamental objective of our foreign policy, as it is of any country. If this is so it is obvious that the Indian Armed Forces have to play an important and increasingly participatory role in the fashioning of our foreign relations and in coping with the changing equations in the international community.

NATIONAL SECURITY SEMINAR (S-26)

SELF-RELIANCE IN THE PROCESSES OF DEFENCE PRODUCTION INCLUDING INVOLVEMENT OF THE PRIVATE SECTOR

APPROACH PAPER

Economic and military capabilities are the basic determinants of a State's ability to pursue an autonomous course in international affairs, a goal that India has sought to pursue since Independence. Since economic and military dependence on external sources is inconsistent with claims of foreign policy autonomy, independent India sought to develop a broad scientific and industrial base, including Defence research and development and production. Policies pursued towards lessening external dependence and building up internal competence have come to be referred to as 'self- reliance'. It implies indigenous competence in critical areas.

India's approach to military acquisition and modernisation has been a mix of direct purchase, licensed local production based on foreign technology, and indigenous production through research and development. Most military equipment in the colonial era had come directly from Britain, and the colonial authorities established a few production facilities only to meet the contingencies that arose out of the two World Wars. Direct purchase was the dominant pattern in the initial years after Independence. Licensed production, which was initiated in the mid-1950s in a small way, had become the dominant pattern by the 1970s. This approach introduced contemporary Defence technologies into the country. Over the years, Indian scientists and engineers of the Defence Research and Development Organisation (DRDO), have produced a broad range of weapon systems, components and munitions. However, their output has not been adequate to meet the goals of self-reliance. The Armed Forces continue to rely mostly on foreign sources for major equipment.

Defence Production and Supplies

The Department of Defence Production was set up in 1962 in the aftermath of the Chinese aggression to create an indigenous defence production base. In November 1965, Department of Defence Supplies was created to forge linkages between the civil industries and defence production units. The two departments were merged in December 1984 into the Department of Defence Production and Supplies.

Since 1962, 16 new Ordnance factories have been set up. Their capacities have been augmented from time to time and they have been modernised selectively, keeping in mind the emerging requirements of the Armed Forces. Presently, 39 Ordnance factories and eight Defence Public Sector Undertakings (DPSUs) are engaged in the task of manufacture of equipment and stores for Defence Forces . One more Ordnance factory is planned to be set up at Nalanda, Bihar. Capacities of the civil sector are also utilised for Defence requirements. The DPSUs are :-

(a) Hindustan Aeronautics Ltd (HAL).
(b) Bharat Electronics Ltd (BEL).
(c) Bharat Earth Movers Ltd (BEML).
(d) Mazagon Docks Ltd (MDL).
(e) Goa Shipyard Ltd (GSL).
(f) Garden Reach Ship Builders and Engineers Ltd (GRSE).
(g) Bharat Dynamics Ltd (BDL).
(h) Mishra Dhatu Nigam Ltd (MIDHANI).

The following organisations are also associated with the Department of Defence Production and Supplies for technical support :-

(a) Directorate General of Quality Assurance (DGQA).
(b) Directorate General of Aeronautical Quality Assurance (DGAQA).
(c) Directorate of Standardisation.
(d) Directorate of Planning and Coordination.
(e) Defence Exhibition Organisation (DEO).

Defence Research and Development

The Defence Research and Development Organisation (DRDO) was formed in 1958 by amalgamating the then existing Defence Science Organisation (DSO) and the Technical Development Establishments (TDEs). A separate Department of Defence Research and Development was formed in 1980 to improve administrative efficiency in the sanction and management of complex high technology projects for design, development and production of state-of-the-art weapon systems, equipment,

platforms and sensors undertaken by the DRDO. In addition to DRDO the Department also administers and funds a society, Aeronautical Development Agency (ADA), engaged in the development of Light Combat Aircraft (LCA).

The Department of Defence Research and Development is dedicated to progressive enhancement of self-reliance in Defence systems and state-of-the-art Defence technologies. It is headed by the Scientific Adviser to Raksha Mantri, who also functions as Secretary, Department of Defence Research and Development and Director General, Research and Development.

The Department undertakes programmes and projects either in response to the expressed requirements of the Armed Forces for design and development of a major weapon system or for competence build-up in emerging technologies that may be required for systems to be developed in future. These programmes and projects are undertaken in wide ranging disciplines such as aeronautics, armaments, missiles, combat engineering, advanced computing, electronics, life sciences, advanced materials and composites and Naval R&D. The Department also supports extramural research on Defence related problems in academic institutions and other national R&D laboratories, through grants-in-aid projects, which are approved and monitored by various R&D boards.

The programmes and projects undertaken by the Department are executed through a network of 49 Defence R&D laboratories and establishments and the Centre for Military Airworthiness and Certification (CEMILAC). These laboratories and establishments are situated all over the country from Tezpur in the East to Jodhpur in the West and Leh in the North to Kochi in the South. The programmes and projects are executed by a workforce of about 30,000 including more than 6,000 scientists and engineers, supported by a budget of the order of Rs 3,000 crore and with adequate delegation of financial and administrative powers to programme and project leaders.

The programmes and projects are executed in close partnership with the Services, Defence public sector undertakings, academic institutions, national research laboratories and private

enterprises, to harness optimally the available national resources and expertise. The 'concurrent engineering' approach is being followed in case of high technology projects to reduce the time lag between design, development and production.

Indigenous Development of Weapon Systems

Our indigenous programmes of weapons development have seriously faltered and have become open-ended exercises. Cases in point are the MBT Arjun, LCA, and the-Pinaka to name but a few. The cause of our failure was that an honest appraisal of our capabilities was never carried out. We tended to make optimistic assessments, which deprived the Armed Forces of modern equipment despite the nation's moral and financial support. This imbalance in expectation and actual performance needs to be corrected.

Simplification or modification of procedures relating to "make", "buy" followed by "make" decisions on procurement of major weapon systems and platforms need to be undertaken. Similarly, the ways and means of linking financial commitments in R&D with performance milestones, also need to be evolved with a view to ensure strict accountability and time responsiveness. The DRDO's formulation of Decision Aid for Technology Evaluation (DATE) for project indigenisation needs to be further honed, before it can be utilised for decision making.

Planning and Co-ordination of Defence Production

The country over a period of time, has made huge investments in the establishment of various Defence Production Agencies and Defence Research and Development establishments. Getting the best value for each rupee invested in this sector is considered necessary. Broad objectives of long term equipment policies and planning on production, and simplification of procedures would need to be laid down.

Self reliance does not mean self sufficiency. It implies indigenous competence in critical areas only. Whether our current research and development policy and approach are correct for this purpose is an aspect for critical examination. Responsibilities for fundamental research and product research need to be clearly

spelt out. As such, the DRDO needs to focus more on core technologies, in which expertise is neither available within the country nor can be procured from alternative sources. There may be a need to rationalise DRDO laboratories and to create close knit interface between specific laboratories on the one hand and production agencies and Service entities on the other.

Private Sector Participation and Competitiveness

The Indian private sector has made significant progress during the last few decades in the industrial and technological fields especially in the field of Information Technology (IT). The country's industrial and technological capabilities and its future potential need to be harnessed to further national security objectives. Measures to provide a level playing field to private industry should be examined, to encourage private sector participation.

Despite the fact that the Defence Research and Development Organisation (DRDO) has a number of achievements to its credit in the core areas, collaborative venture with private sector participation would be required to be institutionalised to instill a spirit of competitiveness and result orientation in both R&D and production. Specific areas where the participation of the private sector is desirable would need to be identified.

Foreign Collaboration

Russia has shown interest in collaborating with India with regard to some of the Defence projects including the LCA. Other developed countries may also be interested. This aspect can be checked. However, a caveat here is that co-operation in defence production or joint development of weapon systems are premised on a high degree of co-ordination in foreign and defence policies. This aspect has to be factored into the matrix of foreign collaboration.

While exercising the "make" or "buy" followed by "make" option, there would be a need to approve acquisition and induction within the specified timeframes and financial outlays, after taking into account all the relevant factors including the existing and potential defence research and development capabilities in the country.

Technology as a Force Multiplier

Technology is today a major driving force. Given the fact that India has emerged as a leading player in several high technology areas, particularly IT, there is a need for continuous upgradation of technology in the field of Defence. Major initiatives in this regard have already been taken by the Government including encouraging the participation of the private sector in this area. Separately, an Inter-Ministerial Task Force has also been constituted by the Government, to carry out a Strategic and Technological Environment Assessment (STEA). The Assessment should be utilised as the basis for further strengthening the capabilities of the Armed Forces.

Export Policy

The review of the existing Defence Export Policy and ensuring the active involvement of private industry in promoting Defence exports, has to be accorded a higher priority. In addition to the expansion of employment opportunities, the economies of scale would help generate both the funds for R&D, and earn valuable foreign exchange. Such exports can also be used selectively for furthering our relationship with target countries.

Seminar Scheme

To examine the aspect of "self-reliance" in the process of Defence Production including involvement of the private sector, it is proposed to conduct a two-day Seminar on 21 and 22 November 2001, with three sessions, two on the first day and one on the second day, as under :-

(a) **Session I.** Evolution of the Existing System of Defence Research and Development and Defence Production and Its Achievements and Inadequacies.

(b) **Session II.** Participation of Private Sector/Industry and Impact of Technology including DRDO, in Defence Production.

(c) **Session III.** Need for Joint Collaboration and Defence Exports to make Defence Industry Viable and Self Reliant.

WELCOME ADDRESS

MAJOR GENERAL Y K GERA (RETD)
DEPUTY DIRECTOR AND EDITOR USI

I welcome you all to the United Service Institution of India for the National Security Seminar 2001 on the subject of 'Self Reliance in the Processes of Defence Production Including Involvement of the Private Sector'. The Seminar is being conducted at a very appropriate time because the overall scenario is changing fast. Technology plays a very important role in the conduct of warfare. Harnessing the appropriate technology for production of weapon systems and precision guided weapons is key to victory during a war. The Seminar is divided into three sessions. The first session is on "Evolution of the Existing System of Defence Research and Development and Defence Production – Its Achievements and Inadequacies". Post lunch, the session will be on "Participation of Private Sector Industry and Impact of Technology, including DRDO, in Defence Production". In the third session we will discuss the "Need for Joint Collaboration and Defence Exports to Make Defence Industry Viable and Self Reliant".

Dr K Santhanam, Director IDSA will deliver the inaugural address. He was the Chief Advisor Technologies with the DRDO. He was very closely associated with the May 1998 nuclear tests. He was conferred with the Padma Bhushan in recognition of services rendered. During his 16 years stint with the DRDO, he has contributed both technically and managerially over a broad spectrum of technologies, spanning diverse areas such as the electronic warfare, information technology, information security, systems analysis, and wargaming. He has also guided the DRDOs successful effort in realisation of the 'pace parallel' computing systems as well as a variety of advanced electronic chips. We could not have asked for a better person to deliver the inaugural address on such a vital subject.

INAUGURAL ADDRESS

DR K SANTHANAM
DIRECTOR IDSA

This Institution that combines the three Services under one roof provides a forum for discussing important tri-service issues. It is not just important for the three Services but also for the Defence Industry Infrastructure. Self-reliance has been defined and understood. In my perspective, self-reliance is :-

(a) The ability not to be vulnerable to 'turning off the tap' in periods of crisis with regards to the Defence Systems.

(b) Utilisation of available national resources - both material and human.

(c) As far as the Defence Forces are concerned, the systems must be appropriate to operating environment.

Self-reliance in fact has been the creed of our freedom struggle. It has to continue to be the creed according to which we build up our strengths internally – indigenously. Our dependence in perpetuity on advanced countries is likely to adversely affect our national interests. In the current environment of economic liberalisation, the general approach is to get the best bargain for the money. However, if we have to grow as a country and take the lifecycle costs into account, we have to progressively increase self reliance capabilities not just in Defence technology but others also. Self-reliance has to be contrasted with self-sufficiency, i.e. food, clothing and shelter. In the fifties when India was dependent on the PL 480 wheat, it was referred to as the 'basket case'; now India is referred to as the 'breadbasket'. This is mainly due to the efforts of our agricultural research institutes in addition to the inputs from abroad. In fact one should not be xenophobic about material coming from outside India. The inputs from outside for the Green Revolution were very significant, and translating laboratory results down to the

farmer through extension schemes is a contemporary major achievement in promoting indigenous technologies.

Unlike atomic energy or the space commission - where there is no user requirement driving them - in defence research and production effort requirements are openly stated. The work gets tightly or loosely coupled according to the user requirement. The Services, the R and D, the production agencies and the QA (Quality Assurance) must all be stakeholders in defence production. There must be synergy between these actors.

There is a need to have transparent honest professionalism coupled with integrity. Based on experience, the test and evaluation cycle by the Services needs serious re-addressing. It is essential that this cycle is developed concurrently with the development process. For instance, there are Summer trials and Winter trials - if you miss one, the window of acceptance due to inadequate trials gets shifted.

There are ways in which the test and evaluation process can be shortened. And this in fact is the experience in most countries that are in an advanced stage of defence technology development.

Regarding commercial-off-the-shelf (COTS) items, there are areas in which these can be used. However, you cannot for instance have COTS in a communication satellite which has to operate under extreme temperature conditions and so on.

With respect to communication systems and networking in the new environment, I would advice acquiring both silicon and software. We are aware of the enormous literature that comes out regarding info warfare concerning the software as well as hardware. So what you may consider a secure

communication may in fact not be so with the key being retained by whoever sold the equipment.

Regarding private sector involvement, the Defence Minister Mr George Fernandes formed five Task Forces with Confederation of Indian Industries (CII) participation. These were very useful. I was the Chairman for all of them. The idea was to ascertain how the private sector and the R and D should interact. The summary is as under :-

(a) It is inevitable that private sector make investments as much in development as in production.

(b) If private sector invests and carries out the R and D but no orders are forthcoming after it has gone through acceptance trials there is some financial burden. However, this is a risk that has to be taken. It occurs in other countries also. A suggestion given is that if an investment of a particular amount is made for R and D and orders are not placed, could that amount be reimbursed at the prevailing rate of interest. Professionals of the R and D sector can also advice the private sector regarding certain pitfalls such as the flight of trained manpower. Recruitment and retention of competent persons is a major problem. The private sector can hold them. This is where synergy comes in.

(c) The private sector must be made aware that investment in the defence sector is not a rosy street of profits. There are large firms who are prepared to enter but are cautious because beyond a certain point there is opacity about how the government functions. There is also opacity about the user's real requirements.

(d) There are opportunities now of forming joint ventures with major foreign firms; the private sector should capitalise on it. But such joint ventures by the

conventional Ordnance factories or PSUs may run into rough weather because the way the government works and the way the other private - Defence - companies want to work may not match.

In my opinion the Forces must be asked for their requirements say a decade or so ahead and not in the immediate future as these are being met by the existing infrastructure productions supplemented by imports. The Services must also guide the industry on what they want. If the private sector comes in and tries to edge out the Ordnance factories and the PSUs, it is not likely to work.

Regarding the make or buy system, the Arun Singh Committee report places abundant faith on the R and D capability of the PSUs. The Ordnance factories and PSUs predate the formation of the DRDO itself. There is a culture of the Services, there is a culture of the production agencies and there is a culture of the R and D. R and D necessarily has to be aggressive and forward looking. Production agencies go in for stability - do a bit of production planning, a bit of manpower management, and deliver. So while there is caution as part of the culture, in the production agencies, there has to be necessarily aggressive thinking on the part of the R and D. A conflict of cultures is, therefore, inevitable.

Barring some notable exceptions, the R and D activity in my opinion in bulk of the Ordnance factories and PSUs is low for a variety of reasons. The priority is production and R and D is secondary. This is one of the reasons why ADA (Aeronautic Development Agency) was created as a society because the aeronautical design bureau in HAL was weak. The Task Force report emphasises that R and D should focus on futuristic research and all product R and D must be done by the PSUs. There are instances where we worked jointly. Some of the lessons of the past have been understood by the

R and D and even at the stage of responding to qualitative requirement (QRs), in certain cases production agencies have been identified. This needs re-addressing.

The users, i.e. the three Services have to be a lot more realistic in formulation of QRs. There is a requirement of realism on the part of the R and D and the production agencies in terms of what they can really do. Project grabbing attitude of the R and D is showing signs of decline.

It is noticed that success has been there whenever the user, the R and D and the production agency have been together. Synergy has helped in realism in specifications, delivery of the product ahead of schedule and proper product support.

But can this synergistic combination last? It can, with stable partners. But the third part of the triangle - the users - face an array of changes necessarily occurring in terms of career management. I have no solution available for this. Unless we work as stakeholders, together, nothing will fructify.

EVOLUTION OF THE EXISTING SYSTEM OF DEFENCE RESEARCH AND DEVELOPMENT AND DEFENCE PRODUCTION AND ITS ACHIEVEMENTS AND INADEQUACIES

FIRST SESSION

Chairman : **Lt Gen Chandra Shekhar, PVSM, AVSM (Retd).**

First Paper : **Lt Gen M R Kochhar, PVSM, AVSM (Retd).**

Second Paper : **Lt Gen SS Apte, PVSM, AVSM (Retd).**

Third Paper : **Shri S Sen, Dy Dir Gen, CII.**

Discussants : **Maj Gen Ian Cardozo, AVSM, SM (Retd).**
Air Mshl Bharat Kumar, PVSM, AVSM (Retd).

CHAIRMAN'S REMARKS

LIEUTENANT GENERAL CHANDRA SHEKHAR PVSM, AVSM (RETD)

Self Reliance in defence production remains a distant goal despite considerable investments made in the DRDO and public sector undertakings. Some of the reasons for the lack of desired pace of indigenisation are :-

(a) Lack of synergy between the Defence Services, the DRDO and the production agencies.

(b) DRDO has spread its field far too wide rather than concentrating on important areas and thus discouraging other players including the private field. Long Term perspective plans are not realistic.

(c) Time and cost overruns resulting in inordinate delays and fielding old technologies except in a few areas such as missiles, small arms and electronics.

(d) The General Staff Qualitative Requirements (GSQRs) being accepted are very ambitious and the DRDO is a party to its acceptance.

(e) Reluctance to enter into government collaboration and promote exports by the concerned departments.

However, recently, the government has approved a new Defence Management Structure where a Defence Acquisition Council under the Defence Minister, and three separate boards for Procurement, R & D and Production, have been created. This would have members from all the major players; and it would provide greater synergy and coordination.

Finally, it would also require changes in the industrial policy to de-license some of the Defence industries and encourage private sector participation. There is a need to develop a 'consortia' of ancillary industries and follow a 'concurrent' approach.

Despite having a number of achievements to its credit in the core areas, collaborative ventures with private sector participation would be required to be institutionalised to instill a spirit of competitiveness and result orientation in both R & D and production. Specific areas where the participation of the private sector is desirable would need to be identified.

FIRST SESSION : FIRST PAPER

LIEUTENANT GENERAL M R KOCHHAR, PVSM, AVSM (RETD)

The requirements of the Army for general stores, clothing and armaments were met mostly by imports from the UK since the East India Company days until the end of World War I. Efforts were, however, made during this period to set up some production facilities in India so as to supplement the imports from the UK. Consequently a number of production units came up in the country. As the tempo of defence production increased during World War II, the undermentioned Directorates were created under the Master General of Ordnance (MGO)/ Director General of Supplies and Distribution (DGS&D) at Army Headquarters :-

(a) Directorate of Armament, MGO Branch.

(b) Directorate of Mechanisation , MGO Branch.

(c) Controllerate General of Inspection, DGS&D, Ministry of Industries and Supplies.

These organisations were grouped in 1946 to form a composite inspection, research and development organisation known as the Directorate of Technical Development in MGO Branch. For the first time, full control of all functions relating to inspection, testing and research and development of armaments, instruments, electronic stores, vehicles, engineering stores, medical store and Petroleum, Oil and Lubricants (POL) etc were vested in a single technical-cum-administrative authority.

In 1947, the post of MGO in the Army Headquarters was abolished and the Directorate of Technical Development (DTD) organisation was placed under the General Staff (GS) Branch. When the MGOs Branch was re-established in April 1949, the Directorate of Technical Development came under

MGO's control once again. In 1955, on the recommendation of the Armed Forces Reorganisation Committee, the DTD was transferred from Army HQ and placed under the Ministry of Defence, under the newly created Controller General of Defence Production. The DTD was bifurcated in 1956 into two separate directorates, ie Armament and General. In 1958, a beginning was made to bifurcate the research and development inspection functions of these two directorates. The present Defence Research and Development Organisation (DRDO) was set up by amalgamating laboratories, establishments of Defence Science Organisation with the Technical Development Establishments of the Defence Services to take up design and development of weapons and equipment in addition to rendering advice to the Services. A separate Department of Defence R&D was formed in 1980 to improve administrative efficiency in sanctioning and management of complex high technology projects.

The DRDO is dedicated to progressive enhancement of self-reliance in defence systems and state-of-the-art defence technologies. To accomplish this mission, there is a mission-mode structure headed by the Scientific Adviser to Raksha Mantri (RM), who also functions as Secretary Department of Defence R&D and Director General R&D.

The Department of Defence R&D executes various projects and programmes through a network of 49 laboratories and establishments of DRDO located all over India apart from Centre of Military Airworthiness and Certification (CEMILAC). The Department also administers Aeronautical Development Agency (ADA), a society funded by the Department, which is engaged in design and development of the Light Combat Aircraft (LCA). The projects and programmes are executed by a work force of about 30,000 including more than 6,000 scientists and engineers and 17,000 technicians supported by an annual budget of about Rs 3,000

crores with adequate delegation of financial and administrative powers to project leaders. It may be interesting to note the budget of last five years :-

(a) 1997-1998 – Rs 1978 crores.

(b) 1998-1999 – Rs 2300 crores.

(c) 1999-2000 – Rs 2827 crores.

(d) 2000-2001 – Rs 3273 crores.

(e) 2001-2002 – Rs 3508 crores.

The DRDO has grown from an agency carrying out science-based technical improvements to the existing systems to high technology agency capable of undertaking *ab-initio* design, development, and integration leading to production of world class weapon systems meeting qualitative requirements of the Defence Services. The DRDO has developed and produced large number of defence systems like, missiles, Pilotless Training Aircrafts (PTAs), EW systems, guns, small arms, fire control systems, ammunition, laser range finders, Night Vision Devices (NVDs), advance computing systems amongst many others. Defence systems developed by the DRDO have an average annual production value of Rs. 1,000-1,500 crores.

There are institutionalised programme or project monitoring and review mechanisms in the Department. At the apex level Defence R&D Council under the chairmanship of Raksha Mantri, with the three Service Chiefs as members, carries out a periodic review and provides directions for policy and planning. There is an in-house apex body called "DRDO Channel" chaired by Scientific Adviser to RM, to review progress of major projects of all the laboratories. In addition, corporate reviews covering techno-managerial aspects are also carried out by a high level committee. The staff projects for the Army are reviewed twice a year by the Vice Chief of the Army Staff (VCOAS).

Achievements

The DRDO has made significant contributions in enhancing combat effectiveness of the Armed Forces.

The Integrated Guided Missile Development Programme (IGMDP) has been one of the major achievements of the DRDO towards self-reliance in the field of high technology. The status of missiles being developed under IGMDP is as follows :-

(a) *Prithvi* surface-to-surface tactical battlefield missile: it has a range of 40-150 kms. It carries a warhead of 1,000 kg. The range can be extended to 250 kms with a warhead of 450 kg. *Prithvi II* for the Air Force and *Dhanush* the Naval version, have been flight tested.

(b) *Akash* medium range surface-to-air missile, has a range of 25 kms. User trials are planned in 2002 after which it will go into production.

(c) *Trishul* quick reaction surface-to-air missile, has a range of 9 kms. So far 57 development flight trials have been undertaken including the naval version. It is likely to go into production by end of 2002 at BDL (Bharat Dynamics Limited).

(d) *Nag* is a third generation anti-tank missile with 'top attack' and 'fire and forget' capability. So far, 38 developmental flight trials have been conducted achieving a range of 4.18 kms, thus proving its performance parameters.

(e) *Agni II.* After completion of three flight tests of *Agni I, Agni II,* which is the long range version, has been successfully flight tested from mobile launchers in its operational configuration. It can be configured for any type of warhead. Limited series production of *Agni II* and its induction into the Armed Forces has been cleared.

There are certain *Electronic and EW Systems* whose details are as under :-

(a) **EW System 'Tempest'**. Under project Tempest, 75 series produced Radar Warning Receivers (RWR), code named 'Tranquil' have been delivered for MiG-23 and MiG-27 aircraft. Development of a more advanced RWR for MiG-21, 'Tarang', has been completed.

(b) **Samyukta.** This is an integrated EW programme for electronic reconnaissance, analysis of enemy's electro-magnetic emissions in communication and radar frequencies and for taking electronic counter measures (ECM). It is in an advanced stage of development.

(c) **Sarvadrista.** It works on Earth station to receive satellite based imagery data from IRS IC, and ID, processes the imagery data automatically and disseminates the processed data through a satellite link to any other place.

(d) **Sangraha.** The project envisages design and development of a family of five ESM/ECM systems for airborne, submarine and ship-borne platforms of the Navy. User trials of one of the systems 'Kite' have been successfully completed leading to its induction.

(e) **Sectel.** The subscriber and secrecy device (SECTEL) has been developed for the Army, the Navy and the Air Force, and productionised.

(f) **Pulse Doppler Radar.** Development of Marine patrol radar for Naval Advance Light Helicopter (ALH) has been taken up for acquiring information on hostile sea surface and airborne targets.

(g) **Command Information and Decision Support System (CIDSS)** 'Samvahak' is a Corps level CIDSS to

gather and process operational intelligence and logistics information for commanders. System design has been completed and documents have been prepared.

Details of *Armament* are as under :-

(a) **The 5.56 mm Indian Small Arms System (INSAS)** family consists of fixed and foldable butt version of the Rifle, LMG (Light Machine Gun) and Carbine with common ammunition for all the weapons. A large quantity of Rifles and LMG with ammunition have been produced and delivered to the Army.

(b) **125 mm (Fin Stabilised Armour Piercing Discarding Sabot) FSAPDS (Soft Core).** Free flow production of 125 mm FSAPDS (soft core) capable of defeating all known armour has been established at Ordnance factories. Over one lakh rounds have already been supplied to the Army.

(c) **Multi Barrel Rocket Launcher–Pinaka.** It has a range of 39 kms and can fire a salvo of 12 rockets in 44 seconds. User-cum-troop trials have been completed.

In the area of *Aeronautics* :

(a) **Remotely Piloted Vehicle (RPV} - Nishant.** It is an unmanned aerial vehicle for battlefield surveillance, real time target engagement and damage assessment. The RPV has been successfully flight tested and has undergone user evaluation in February 2001.

(b) **Light Combat Aircraft (LCA).** The first LCA technology demonstrator (TD-1) was flight tested on 04 January 2001. It is likely to be inducted into service in 2005.

(c) **Kaveri.** Kaveri is an advance technology engine for the LCA. Six prototypes of Kaveri have undergone testing for a period of 1000 hours. The trials are likely to continue well into 2002.

Combat Engineering Systems are as follows :-

(a) **Main Battle Tank - Arjun.** The MBT Arjun has been indigenously designed and developed to meet the most stringent specifications of the Indian Army, which has placed an indent for 124 tanks on the Ordnance Factory Board in the 10th Plan.

(b) **Mechanically Launched Assault Bridge - Sarvatra.** Sarvatra is a universal bridging system to overcome obstacles of varied nature to bridge gaps ranging from 15 to 100 metres. The 15 m Span Bridging System has been recommended for introduction into service. The 20 m span bridge is undergoing user trials.

In the *Naval Systems* :

(a) **Advanced Experimental Torpedo (AET) - Shyen.** The AET is a light weight anti-submarine torpedo launched from ships and helicopters. User trials have been completed. It is likely to enter production phase in the near future at Bharat Dynamics Limited.

(b) **Wire Guided Torpedo (WGT).** WGT is a heavy weight-torpedo launched from submarine. The system is in final stages of technical trials.

(c) **Sonar - Mihir.** Mihir is the first dunking sonar developed for figment on ALH (Advanced Light Helicopter). It is being produced at Bharat Electronics.

(d) **Nagan.** This is an active-cum-passive towed array Sonar system developed by the DRDO for fitment on surface ships. Bharat Electronics is the production agency.

In addition to the above, the DRDO has made significant contribution in the field of Advance Computing Systems and is providing scientific support to the Services in a large number of areas of military sciences and life sciences such as airworthiness services, going maps, wargaming software, aptitude tests and psychological studies.

Inadequacies

It is debatable as to how impressive is the list of achievements of the DRDO. But it must be remembered that these achievements have been made despite several handicaps and impediments. Some of the inadequacies of the DRDO are :-

(a) **Multifarious Disciplines.** DRDO is dealing with every conceivable field of defence technology, weapon systems and equipment. As a result the application of resources is thin right across the spectrum of its activities. The focus, therefore, is getting lost.

(b) **Infrastructure.** Lack of infrastructure both at the National and DRDO level has been a severe handicap. While undertaking a project, the DRDO has to first build the necessary infrastructure and then proceed with design and development work, resulting in long gestation period and development cycle.

(c) **Technology Development.** Since many of the latest technologies are not available in the country, technology development alongside design and development has to be resorted to, which may not always be a success in the first go. This leads to time over-runs.

(d) **Technology Denial.** Whenever a project is undertaken, it is presumed that certain technologies would be available from friendly developed countries. However, it has been experienced that due to unforeseen reasons, these technologies are denied to the DRDO resulting in failure to develop the product in the promised timeframe.

(e) **Frequent Changes in Qualitative Requirements.** The QRs given by the Services are often very ambitious. Besides, frequent changes in the QRs often result in time over-runs beyond the control of the DRDO. At the same

time, the user is often forced to recommend changes due to certain parameters becoming outdated; reason being the long development time taken by the DRDO.

(f) **Optimistic Estimation.** The DRDO is invariably very enthusiastic and optimistic in their initial estimation of time which often results in failure to meet the specified deadlines at the cost of its credibility.

(g) **Complacency Due to Monopoly in the Defence Sector.** The DRDO has complete monopoly in Defence research and development. This lack of competition has resulted in complacency and lack of sense of urgency on the part of the DRDO.

(h) **Isolation from the Private Sector.** Since the Defence sector has been a holy cow in India, the DRDO has invariably been working in isolation from the private sector to the detriment of the country. This attitude has been responsible for the DRDO not parting with or sharing technologies developed by it, with the private sector. This, however, is changing now.

(j) **User's Perception of DRDO.** Defence Services look upon the DRDO as a hindrance in their modernisation plans. Import of urgently needed weapons and equipments is denied to the Services based on the promises made by the DRDO, which are not kept.

(k) **Administrative Expenses.** It has been seen that due to heavy administrative expenses, the allocation of funds for technical development work fall short of requirements resulting in dilution and time over-run.

(I) **Human Resources.** It has been the experience that DRDO is not getting the best of scientists and brains in the country for want of adequate incentives. There is also lack of continuity in projects.

(m) **Service Representation.** As per policy, 50 per cent of the DRDO officers are to be from the Defence Services to encourage constant interaction between the users and scientists. The representation of Service officers has been progressively declining. Presently, only 69 permanently seconded officers are left in the organisation; they too will retire in the next few years. This could lead to serious deficiency of user inputs in the design and development of weapons and equipment for the Defence Services.

Conclusion

The DRDO is the nodal agency in the field of Defence technologies in India. Over the years the DRDO has grown from 'know-what' and 'know-how' phase to 'know-why' phase due to sustained and untiring efforts of its scientists, engineers and the officers in uniform. The DRDO's capability embraces the whole gamut of research and development, prototyping, test, evaluation and Transfer of Technology (TOT) activities including pilot production of crucial items in various multi-disciplinary complex fields. The DRDO is thus committed to meet the technological needs of the Armed Forces with the ultimate aim of driving the nation to self-sufficiency in the field of Defence systems and technologies.

FIRST SESSION : SECOND PAPER

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From the period before World War II till independence, defence production was almost exclusively carried out in the Ordnance Factories (OFs) for guns, small arms and ammunition. In late fifties the Controller General of Defence Production, (CGDP) was appointed. He and his successor were distinguished technocrats assisted by a team of engineers with considerable production experience. They planned for setting up some 16 OFs, and new Public Sector Undertakings (PSUs). In 1962 the Department of Defence Production (DODP) replaced the CGDP and the entire control passed to civil servants. Almost all the defence production units seen today are the result of planning by CGDP, with hardly any additions thereafter. Equipment common to civil and military use was procured from civil manufacturers or by import. The DODP and the production units developed very good expertise in setting up new projects and establishing foreign collaborations. Many state-of-the-art technologies were introduced. There was considerable stress on indigenisation of imported equipment and parts. However, modern management processes and work culture were slower to improve and have still to go a long way, particularly in the OFs.

This paper focusses on the inadequacies of the OF system and the Indian Army in the post-independence period that have prevented the former from giving its best. During this period production costs have remained high and delivery schedules tardy. The reasons are many.

Firstly, some production units were located to serve party politics rather than techno-economic needs. Thus, Vehicle

I am basing the observations and conclusions made in this paper on my own studies and participation in those done by top foreign and Indian experts during 1964 to 1994 for the army's inventory control systems, the system of managing production at the DODP, the OF system, related civil industries, captive PSUs under DODP, and others such as Bharat Heavy Electricals Ltd, and their captive customers i.e. State Electricity Boards.

Factory Jabalpur (VFJ) was located farthest from the large number of component suppliers. The sophisticated plant for manufacture of MiG aircraft was located in an inaccessible and backward area, ostensibly for the uplift of the tribal population. Bharat Earthmovers Ltd was set up to meet defence needs, which lasted barely six years. The production units and the users have paid the price for such unsound decisions by DODP, in terms of higher production cost and delays in supply.

Secondly, the process of planning and control of production at DODP remained rigid and archaic. Recommendations of foreign consultants and Indian experts were ignored. It can be said that performance of the defence production units was nowhere near their potential because of these factors. The short tenures of the decision makers, who were from the generalist cadres made them reluctant to heed the advice of management experts for change. Pressures for setting up many new projects also took away the priority for these matters.

Thirdly, the Army has been using unsuitable forecasting methods for weapons, equipment and spare parts, causing problems for production. Expert advice in this matter was ignored.

Fourthly, the production planning process within the OF system unnecessarily delayed the start of production. Expert advice that was given in 1965 and later in 1978, to improve the same, was ignored.

The Life-Cycle of Materials

The performance of a production system is to be judged by the cost, quantity, quality and timeliness of delivery of the ordered equipment/materials. The indenter (army) and the producer (OFs) are under the common control of the Ministry of Defence (MoD). This makes them a 'captive' system. Hence, their interactions must also be considered to

judge the performance of the production system, which is only one part of the life cycle of materials. The stages of the life cycle of materials (including equipment) that jointly affect the user and the production units are: *'Design'* (for ease of production), *'Determination of requirements'*, (quantities needed to equip units and reserves), *'Usage, discard and replenishment'* (inventory control). These are now being considered.

Multi-User Equipment

The Army defines the desired performance of the equipment through the document titled, "Qualitative Requirements" (QR), in general terms, to give the designer a flexibility to choose production processes and materials. Ideally, the Army should get ex-stock delivery, immediately on demand and choice of supplier. These are the characteristics of consumer goods, which are always produced and stocked *in anticipation of demand that can be accurately forecasted (due to their huge and steady volume of demand contributed by many users).* Both users and suppliers prefer this "Production To Stock" system. Recognising this feature, design and manufacturing technology in the West have aggressively moved on to make even complex, durable products like TV sets and refrigerators as consumer goods through high volumes.

The demand and production pattern in the defence system is the opposite and loses all the cost and delivery advantages of consumer goods. The demands being from a single user, the order quantities are too small to be economic and too variable and uncertain to enable best utilisation of production capacity. The challenge to the designer and the military user in India is to get the advantages of consumer goods production for the complete equipment (or parts of it) typically, by using common civil equipment with or without modification. Choosing components that are interchangeable with civil or army equipment will also increase their

production volume. The Hummer vehicle of the US Army has a common front and rear axle *for all models.* This old concept has not been fully exploited here, as user/designer/producer do not take enough initiative in doing this. The case study of army vehicles (Appendix A) shows the effects of grossly ignoring this and selecting the wrong models of army vehicles.

Export to Increase Production Volume

Western countries create economic volume for military equipment by export, even at a subsidised price as USSR used to do. To attract Indian products abroad the defence production units must first *significantly* improve their productivity. Till then, the MoD should export subsidised defence products. The subsidy will be much less than the present higher cost of production, through which *the army is indirectly subsidizing the OFs anyway.* MoD could also collaborate with another country to produce in India for sale elsewhere. But in 1969, the then Minister of State for Defence publicly refused the idea of export of manufactured items. Such shortsighted policies have made defence production costly.

Manufacture-Friendly Design for Small Volumes

Western designs for equipment are for mass production. They are not necessarily suitable for our low volume domestic needs. An alternative is to evolve a design that is economic for low volume production. The general belief that defence stores cannot become high-volume products will remain so unless the possibility is *creatively and aggressively explored.*

One such attempt can be quoted. The aluminium-alloy firing platform for the 105 mm Indian Field Gun Mk II was *designed for manufacture* by HERF (High Energy Rate Forming), an explosive process that required negligible capital investment and could be made one piece at a time, immediately on demand. With such a design planning for

production being easy; the supply lead-time being just the shipping time, and with no inventory required, the production is fast. The Japanese have applied this concept of Just-in-Time (JIT) management for assembly lines for mass production. They have also introduced *mass customisation in their design* – a concept that defence designers could emulate.

Mental Blocks to Creative Exploration

If anyone says "impossible for defence equipment" for the above concepts, one should see how many 'impossibles' have been achieved in every field by creative exploration. Western industry's statistical quality control during World War II measured defectives in 'per cent', 0.10 per cent being treated as good quality. The Japanese approached the challenge creatively and reached level of defects measured in "parts per *million*" (PPM). Such a breakthrough is possible only when one breaks through the mental barriers that block one's creativity.

To beat competition, General Motors gave ex-stock delivery of all models of trucks. The common machine for manufacture of chassis sections was the press. They took 16 hours to re-tool this press when changing models, and continuous operation was required for several shifts to minimise frequency of time-consuming re-tooling. But this created inventory of sections for all models as the demands of a given model could not be accurately forecasted. This is "made-to-stock" production. By using creative exploration Toyota reduced the re-tooling time from *16 hours to 7 minutes* and offered immediate delivery without keeping any stock.

Since 1975 the Indian Army's Corps of EME have worked with the designers for "maintenance friendly" designs. Incorporating maintainability features in the design is now an accepted practice. In the same way the manufacturer and designer should jointly develop "manufacture-friendly" designs for creating designs for small volume production.

This will benefit spare parts production enormously, as explained later in this paper. Involving the user with designers for users' needs and for cost reduction through Value Engineering (VE) is already in vogue. It should be extended to develop product designs in this new dimension of economic low volume production. Army's Base Workshops are already using VE specifically for low volume production of some spare parts which the industry finds uneconomic to produce. This approach should be extended to all new designs.

Determining Initial and Replenishment Requirements

Even when the Army's requirement is large, Ordnance Factories (OFs) often get variable and small orders as each one covers a limited horizon. OFs are not permitted by DODP to begin production till a firm demand is received from the Army and cannot work on economic batch size, nor induce steady (hence, cheaper) supply of raw materials from their suppliers. These effects are best explained by the case study at Appendix A which shows how OFs were forced by MoD, DODP, and the Ministry of Industry to produce in the most uneconomic manner. The Army accepted their policy without recognising its damaging effects. In this and many such cases neither the Army nor the MoD had really understood the complex dynamics of production or distribution system, nor taken note of the advice of experts in the field.

Small Volume Orders

Budgeting process inevitably split production orders. This often makes them uneconomic to produce. Typically, the Ministry of Finance (Defence) refused to clear a long term order on the only domestic supplier for piston rings for tank engines for quantities beyond those needed for the batch of the few engines sanctioned for immediate production. The supplier refused to even look at this uneconomic order. Production of engines was held up for months.

Small, variable orders prevent suppliers to the OFs from investing in capital equipment for efficient production. Also, it introduces uncertainty in all related aspects. The MoD does not seem to appreciate the extra direct and indirect cost and planning burden placed on the OFs due to order splitting. Finally, the forecasting process of the Army that is suitable for large-volume general stores is quite unsuitable for production of weapons and equipment and adds to the problem. OFs are not allowed anticipatory production nor given a firm long-term production order.

Production of Spare Parts

Spare parts have intrinsically small and erratic consumption rate. Total requirement for several years or even lifetime of the equipment is uneconomic for independent production, as weapon populations are not large like consumer durables. It makes sense to order maximum (even life-time) quantity of spare parts when the equipment is in serial production. The extra cost of carrying inventory (and the left over inventory when the equipment becomes obsolete) is quite visible to everyone. The effects of inadequate stocking viz, continued off-road state and the delayed repair and cannibalisation from partly failed equipment that results in their being written off, is not visible. A cost-benefit analysis for some equipment had clearly shown me the merit of much more generous spares backing in place of the very small quantities ordered to save on inventory carrying cost as at present. When the order quantities are very small (and vary considerably from year to year) the manufacturer often ignores the accepted delivery schedule, and accumulates such small orders before taking up manufacture. This causes delay in supply anyway (Case of firing pin -Appendix C).

In the tank factory project at Avadi, capacity for spare parts production was wisely included; but was not utilised for almost seven years, since after producing the Army's needs for initial spares, for two years, there was hardly any

consumption in the small, young fleet in these initial years. As new tanks were added and the fleet began to age, requirement of spares exceeded capacity by several orders of value. Had the Army and the MoD foreseen this, they might have understood the merit of procuring spares in quantities much larger than the immediate needs and keeping a steady load on the factory.

'Common Destiny' Principle

The problem of economic production of spares has been discussed threadbare by DODP with the industry, since 1965, for over thirty years. Yet, no worthwhile solutions have come up due to the shortsighted approach of the concerned officials in the Government.

Traditionally, the attitude in the Government and the organisations under them to other departments in general, and to external product/material/service suppliers in particular, is almost adversary. This makes it extremely difficult to get everyone's cooperation or to coordinate the complex tasks spread over many departments. In Japan, the customer and the supplier sit together and attempt to understand and even solve each other 's problems. They call this the "Common Destiny Principle". Bureaucracy is inevitable in large organisations like the government but it needs to inculcate this principle in their dealings. Currently, lack of communication and one-sided thinking makes the decisions lop-sided or even unworkable.

In India we need to look at the production system and the user's inventory system scientifically; jointly and not independently. The DODPS, the defence production units and their customers (the Defence Forces) should educate their officials in operating this principle.

Forecasting for Military Equipment

Appendix 'B' explains how and why the induction and

replacement pattern of military equipment is highly variable and difficult to forecast, which is the heart of any inventory control system. Forecasting errors must be fed back for correction. Sophisticated mathematical methods of error tracking and analysis of consumption-patterns are needed for military equipment. NATO countries use these methods but the Indian Army ignores the complex dynamics of the production-inventory control system and uses arithmetical averages with arbitrary and subjective correction factors, virtually with no error tracking. The highly variable demands are attributed to other causes while the real cause is missed and remains uncorrected. Some examples of seriously faulty forecasting are:

- The Requirement of vehicles subject to the Discard Policy (Appendix 'A').
- The Army's forecast of requirement of motorcycles in 1962; this was large enough to induce the manufacturer to invest in extra plant and machinery. The orders never came.
- The value of spare parts estimated as requirement for two years for motorcycles in service exceeded the cost of those motorcycles.
- The projected requirement of picrite, a critical component of explosive for artillery shells would have required almost three full factories to be set up. This was too obvious to be ignored. On querying it, the figure was sharply reduced.
- Bharat Earth Movers Ltd (BEML), which was created to meet the projected requirements of earthmoving equipment, had no work for seven years after start and had to divert their entire capacity to civil needs for several years in an ad-hoc way.

Equipment Policy

In the long run the policies for overhaul and/or discard of military equipment will determine the production and inventory policies at various stages of life of the equipment. Life Cycle Costing (LCC) has been discussed in the MoD since 1968 but no quantitative analysis has been attempted. Major changes in the overhaul and discard policies make it almost impossible for a production system to react speedily or economically to the needs of the Army. Uninformed assumptions also play havoc with planning. Typically, the discard policy of vehicles enunciated in 1964 dispensed with overhaul so as to get a good price for vehicles discarded without overhaul. While the civil versions (Mahindra jeeps and TMB (Tata Mercedez Benz) vehicles) fetched excellent price after they were discarded, Shakitiman and Nissan (VFJ) (Vehicle Factory Jabalpur) manufacture) could be sold only at close to scrap value and used by the buyers for stripping down and sale as spare parts (after suitable polishing etc).

The Army issues an Equipment Management Policy Statement (EMPS) for equipment introduced in the Army. This is a comprehensive guide for reference by everyone within the Army connected with the life cycle of the equipment. Many a complex analysis on effectiveness of different policy options and different assumptions that was earlier beyond manual applications can now be done on computers. Hence, the inputs to EMPS from the MoD or DODP should be based on a more scientific analysis (of such matters as complete equipment replacement and/or overhaul, and for initial and replacement requirement of spare parts). NATO armies have been using advanced methods for this for years.

Long Production Cycle at Ordnance Factories

At the OFs, preparatory activities such as checking specifications, ordering materials etc begin only when a firm

order is received even for a long run of the product going into several years. Frequent changes to production plan or multiple orders of small quantity increase the workload of and delay from all agencies. Same is the case of checks on specifications of all items by the Authority Holding Sealed Particulars (AHSP) of the Defence Quality Assurance Organisation. This check is carried out by AHSP for every component and operation on every new or repeat order for the same product, even for unchanging long established product designs. There is no system of continuously updating the OFs as and when any change occurs and to check the specification changes on the exception principle, or by computer generated alerts. The setting up of a common database of specifications between the OFs and AHSP and the simultaneous updating at all factories by networking of computers has been suggested to the Director General of Quality Assurance in 1978 but it has not yet been introduced.

The internal planning system of OFs further adds to delays. In 1965, some experts had observed that production orders based on the Army's indents for finished goods (typically, filled ammunition in specified containers duly painted and marked) were being sent only to the last factory in the production chain i.e. the factory which assembles and delivers the end product. At this factory, the quantities required from the next lower factories in the chain of supplies are worked out and ordered on them by Inter Factory Demands (IFD). The process is repeated at several levels. Finally the last factory, say, the Metal and Steel Factory, which may be melting metal, gets the order late by as much as one year. This factory ought to have got the information first so that they could start production at its initial stage. Hereafter, the reverse chain starts in that order. Thus, the metal factory makes the steel and sends it to the next factory for forging, casting etc. If the quantities on the order are large enough, they will process the batch reasonably early. Otherwise, like

the civil supplier they will also accumulate the quantity for the next order, adding to the delay, which then becomes *highly variable*. This goes on through the hierarchy of production system right up to the end factory, which has to face delays from all supporting factories. Various components (such as cartridge cases, fuzes etc) for assembly arrive in an uncoordinated manner. Assembly of product is held up till all the components are received. Planning however does go haywire as the range of products at each factory is far more than in the days when this system was introduced. The lead-time then increases both on the average and in variability. This is most undesirable for production.

The varying lead-time influences the Army's planning. They have to allow for an increase in lead-time for the next indent. Thus, instead of reducing the lead-time, the Army has been forced to extend it to four years for planning. In Western countries, and in Japan, utmost attention is paid to minimising lead-times. *Everywhere in the modern industrial world lead times are shrinking.*

Experts had recommended the "simultaneous parts explosion" approach, in which all factories in the chain of supply and assembly receive simultaneous orders getting advance notice to plan and start production. Despite computerisation this has not been introduced. A combining of this process with specification checks by AHSP had been recommended. These two changes would have reduced the lead-time by at least one year.

The system's decision makers (from Army, MoD, DoDP and Ordnance factories) have permited longer lead time in their planning, with little realisation that this always adds to the instability of the system and demands larger safety margin (of time), thus adding to the lead time parameter for planning. This is a typical bureaucratic solution to a problem. It is probably not appreciated by either the indenter (Army), the

planner-controller (MoD) or the producer (OFs) that long lead-time has disastrous effect on inventories as it creates large errors in forecasts, which is the starting point in the production cycle.

Pace of Decision-Making

The pace of making even critical decisions concerned with the combat capability of the Army is extremely slow in the MoD and DODP. The decision on manufacture of a floating bridge to replace the obsolete Bailey bridge in the Army was delayed for so many years that by the time the collaboration agreement was ready the Army had already bought bulk of their needs of complete bridges at greater expense. When the expensive machinery was finally set up, it was lying idle for want of load. The DODP then went out in search of possible load from civil or its own PSUs. It hardly needs emphasis that civil end users will never treat Defence production as a source except when no one else is allowed to manufacture those items (e.g. shot guns and ammunition)

Capacity Decisions for Defence Industry

After new Army units are fully raised (or modern equipment replaces obsolete ones in the existing units) perhaps over a two-year period, there is practically no replacement (and need for production) till the first batch is due for it. This is analogous to the requirement of seasonal goods like umbrellas. There is a burst of sale during the monsoons and then nothing for several months thereafter. If the manufacturer sets up capacity for the maximum production rate, the facility will lie idle once the requirement drops. The other option is to produce at a steady (hence, economic) rate for the whole year and carry the inventory of finished (or semi-finished) goods for a few months. Generally, one unit of finished goods carried in inventory is cheaper than idleness of the facility per unit of production. If the user can spread his needs over period, the supplier and user can

mutually agree to a capacity less than the maximum but higher than the average and with some inventory. To match capacity with demand, another option is to have equipment or components that are used more widely than by the Army (civil use, exports etc). Large volume demands arising out of multiple users are always more stable, predictable and economic to produce. Comprehensive quantitative cost-benefit analysis of these options has never been done for capacity planning.

Equipment Management in Captive Industry

The strength of a captive industry is in its potential for efficient long-term planning and in effecting quick coordination between the consumer and supplier. This, however, requires that there must be controllers or decision makers who are competent and very knowledgeable in the complex area of production and inventory control of complex systems. This was the position in the days of CGDP, when Defence production got its first real boost. After that there were only generalists whose background gave them little understanding of the complexities of the logistics of a captive industry. One or two individuals remained long enough to understand the visible problems but not the deeper causes or their solutions. This was vividly brought out in 1967, when (late) Shri HC Sarin, Secretary Defence Production asked me to develop management ratios to assess the performance of the PSUs under the DODP. On being asked whether Ordnance factories need to be covered he replied in the negative "because their problems start from here". This was a man who had spent his *entire* service of twenty-five years in the MoD.

Revival of CGDP

Now that some attention is being paid to the logistics in a systematic way in the Army, this critical subject will elicit attention from decision makers. With powerful computers

made available, simulation of different logistic policies could be done quickly for testing the dynamic effects.

When the United States entered World War II, they had already moved from a predominantly production-oriented economy to a predominantly service-oriented. Giant production-distribution systems were in place; and their dynamics well understood and incorporated in decision making. It is on record in the *Official History of the United States in World War II* (volume II) that the efficiency and speed with which Defence production was set up in the US was mainly attributable to the training in management of logistics and related matters at the training institutes in the US, which thousands of military officers, civil servants, managers and engineers from industry etc had gone through before the war started, and more intensely thereafter. This training and experience continues in the US, due to which US Defence logistics was operational in the far shores of Vietnam and later in other theatres of war, at an incredible speed.

In India there is no such training in logistics given to anyone in Defence or in civil. The inputs at the College of Defence Management and the Indian Institutes of Management are not focussed in this area. There is, in fact, a need for a national level institution devoted to research, training and development in logistics management in India. *Such exposure should be compulsory for those concerned with the management of logistics in the MoD, DoDP and Defence forces and related industries.*

As an immediate step, the CGDP organisation should be reinstated with technocrats authorised to take financial decisions and for *planning and controlling* Defence production. They must take notice of the dynamic nature of the captive production-distribution system, and to guide both. The process and quality of long-term planning and short term forecasting of defence equipment and spare parts should be

considerably upgraded using modern, scientific methods (which are well documented elsewhere) including periodic review of their effectiveness (something that has rarely been done so far). Mere computerisation of the existing system will make little difference to the problematic situation described earlier. The logistics arm of the Defence forces owes these steps to the troops on the one side and to the production units on the other. On their part, the production units must maintain the balance by upgrading their *production planning and control systems* and not only the technology.

Financial advisors who have understood the dynamics and cost-effectiveness concepts should constructively give their advice departing from their traditional 'audit approach' in which only that which cannot be done has been emphasised. They should take a more pro-active posture and advise on what can be done to achieve the aims of a policy, procedure, or project.

Appendix A

CASE STUDY - ARMY VEHICLES POLICY

Background

In 1962, Shaktiman and Nissan vehicles were being imported in small quantities in Completely Knocked Down (CKD) packs and assembled in Ordnance Factories. In 1965 the US consultants Messrs Arthur D Little had recommended that there was no sense in making military vehicles in the totally uneconomic quantities required by the Army. Instead, a civil vehicle such as the Tata Mercedes Benz (TMB) from TELCO should be modified for Army use, as the latter had a large civil demand and adding the Army's order would actually reduce its production cost. This reduction could then be partially utilised to offset the cost of imported front axle modification kits to be fitted to the civilian version. TELCO required some foreign exchange for procuring capital equipment to manufacture the kit and eliminate imports beyond an initial batch. This recommendation was rejected, MoD insisting that the defence-made vehicles would fetch good resale value after discard. It was even thought that a civil version of the Army models would later be made to compete with civil models then current in India.

Nothing like what was claimed by the MoD ever happened. The production of Shaktiman and Nissan was too small to be economic. Vehicle Factory Jabalpur (VFJ) was set up against the advice of the consultant. Next door, the Gray Iron Foundry was also added to feed VFJ with engine blocks - all totally uneconomic. VFJ could not find manufacturers (sub-contractors) in India to make the components in the uneconomic quantities, except at very high cost. Later, to reduce cost, the multi-fuel engine was abandoned in favour of the diesel engine and extensive modifications made to use existing components for other vehicles.

The MoD's totally unworkable policy of replacement of military vehicles (called discard policy) was creating wide and unexpected fluctuations in the demand, which no factory, from private sector or the VFJ, could respond to. The VFJ worked with huge backlogs (to ensure that production loads were steady) so that their supply lead-time increased. MoD and the Army reacted by simply extending their planning horizon from two to four years, without checking the real causes for the delay. These delays were built into the policy of discard, though the VFJ got the blame.

Faulty Replacement Policy and Forecasts

As the Army's wartime fleet of vehicles was very old, MoD had developed a policy for replacement of vehicles to ensure for the Army a fleet of reliable vehicles with modern technology. According to this policy, three tonne vehicles were to be discarded after completing seven years or 60000 km, *whichever was earlier*. Overhaul was discontinued on the assumption that the discarded vehicles would still be in good enough condition for civil use and would fetch good price. The time limit of 7 years was set on the assumption that by then the technology would be due for upgrading. These decisions were largely subjective judgements without field data on performance and without sensitivity analysis of the effects of possible errors in judgement, though the policy involved several hundred crores of Rupees in value. The Army accepted this proposal as it gave them hopes of modernizing the old fleet.

When the policy was being finalised someone in the MoD unilaterally changed the condition to "7 years or 60000 Km *whichever was later*". The Army never realised the damage this change was going to make to the purported aim of having a reliable fleet and accepted it without a single objection being raised. The policy began to fall apart within three years. A large proportion of the 3 tonne fleet operated as third line transport in J and K and the eastern states mostly in

operational area. These vehicles completed 60,000 kms within two to three years but could not be discarded. By the time they were ready for discard (7 years) they had done 1,50,000 to 2,00,000 kms (far beyond the intended limit) and were in dilapidated state during their last three to five years, thereby giving poor service and also overloading the repair system and the spare parts supply (which was also from the same source, i.e. VFJ). On the other hand, most of the unit vehicles, which had done 7 years but not enough kms had to stay in service for as much as ten to twelve years before they could be discarded. Their condition was poor, as they were not used adequately due to an embargo on their use by the Army to save fuel.

All this had completely distorted the pattern of replacement. For several years VFJ had no load and then so heavy a load that it could not cope. Hence, several thousand civil TMB vehicles were bought; some were fitted with costly, imported front axles, spending several times the original request for foreign exchange required by the supplier for capital investment. Even then there was great delay in supplying the modified vehicles to overcome shortages in field units of the Army.

These shortages became so acute that units continued to hold the dilapidated vehicles even when they were overdue for discard. To that extent the Army's inventory continued to show holdings, for which no orders could be placed on the VFJ, though the above situation was well known to the MoD. As years went by the paradox became so acute that in 1972 VFJ was begging for load and asking MoD's permission to sell vehicles to civil market even as field army units were crying out for replacements for these badly aged vehicles.

Throughout this situation the Army continued to forecast requirement on traditional arithmetical averages of past issues even though the discard policy had created extremely large

year-to-year variations in the requirement of the vehicles from VFJ. These forecasts continued to ignore the dynamic nature of the replacement process (called 'life and death process' in operations research and well documented for years in foreign and Indian literature). The Army's forecasts had errors of -200 per cent to + 500 per cent. Yet, the method of forecasting was not even questioned either in the Army or by the financial advisors. In fact, since the Army's forecasting system has no element of tracking errors, this huge variation went unnoticed. This continued even though in 1970 a high-level study group on discard policy for vehicles had pointed out the errors and suggested a scientific and accurate forecasting method. Such a process had already been in use in the USA and the UK.

There appears to be no one in the MoD, the Department of Defence Production, or the Army to study, analyse, and take bold decisions on studies already done on the 'systems'.

Appendix B

VARIANCE INDUCED BY DYNAMICS OF MULTI-ECHELON SYSTEMS

Industrial Dynamics

A unique phenomenon of multiplication (and distortion) of front-end demands takes place in every multi-tier distribution system, typically, from factory to a central depot, to regional depots, to local warehouse to retailers. Steady demand through this chain is completely disturbed in response to any rise or fall at the retailer's end. As the demand always varies somewhat from period to period at the retailer level, there is a tremendous multiplication of the value of the change in the system. Thus, a 10 per cent random increase or decrease at the retailer's end may set up 200 per cent to 2000 per cent up or down change in the demand on the factory. This process was first noticed in 1952 by the BAOR (British Army on the Rhine) as the Occupation Forces in post-war Germany and later, by the Heinz Soup Company, who had one of the largest distribution systems in the USA. Both these organisations developed separate solutions for them. Dr Forrester of Massachusetts Institute of Technology generalised these effects and their solutions in his famous path-breaking book, *Industrial Dynamics*. Some of these system-effects can be analysed by the Operations Research technique of Markov analysis.

Army's stocking and distribution of all stores, equipment, stationary, spare parts are through a multi-echelon system and has the system-dynamics described above. Army's decision makers do not know or did not acknowledge the existence of the effect, even when it was pointed out to them. An example will illustrate this effect. During 1965- 68, there were many increases and cancellations of demands of tentage on the OFs due to large fluctuations, which were ascribed to other factors. The problem is greatly amplified for spare parts

for which there are also other complicating factors, which tend to hide this powerful effect. The Army's procedures for distributed inventories do have some moderating factors that are good enough for large volume items such as general stores (uniforms, boots etc) but totally inadequate for equipment, accessories, unit-assemblies and the huge range of spare parts. Even then, too frequently, intermediate depots declare stocks as surplus to their requirement in one period and demand as urgent replenishment soon afterwards. Such out-of-phase effects are due to unprotected dynamics of distribution systems. Mathematically, these effects have been identified. They are like the surges in electric power distribution systems.

Army's arithmetical forecasting system does not cater for these situations. Had the sophisticated techniques been used for forecasting of the requirement of vehicles, even with the unworkable discard policy, the Army could have at least helped plan the induction and discards better, reduced the lead-time and the wasteful high level discussions on non-supply.

Appendix C

CASE OF FIRING PIN FOR A MORTAR

The firing pin of a certain mortar was indented by the Army, to cover the requirement for the short period of two years at the time of introduction of the mortar in the Army. This quantity was added by the concerned OF to the quantity required for the initial production of the mortar itself. As the equipment is not used much in peacetime and the item had a long life, there was no replacement for several years. When the consumption began, the stock was reduced and the Army placed a demand to cover the equivalent of two years' requirement at the newly observed rate of consumption. Production of the mortars had stopped long ago, and in this order, quantity of the pins was too small for the factory to set up complex tooling etc, for the machine exclusively for this item, since the machine had many earlier jobs waiting. Therefore this order (an Inter Factory Demand -IFD) awaited attention. Year after year the field units went without this critical item and many mortars stayed non-functional. The complaints were progressively raised to the level of Secretary DP, MGO Army and the Director General of Ordnance Factories (DGOF). Every month the progress review meetings discussed this and many more such items. All that happened was that the DGOF was asked to look into it. There was no improvement as other items took priority.

And what about the enormous amount of time of the top officials in the DODP, the Army and the DGOF that is wasted so frequently? This reduces their attention to their proper role of long term planning.

When too many matters become critical, everything loses priority. When this happens frequently, cynicism sets in. Probably because of this, no attempt seems to have been made by anyone to look into the real cause. Indeed nothing

was done to consider the practical suggestion given by experts that OFs could be asked to indicate in advance their preferred (economic or convenient or both) quantities for production of such items on the cost-effectiveness basis.

FIRST SESSION : THIRD PAPER

SHRI S SEN

Defence and industry partnership really got a fillip in 1998 when the then Defence Minister gave instructions for setting up six Joint Task Forces involving industry, the Government and the Armed Forces. The Task Forces covered long-term partnership, IT, exports, commercial procedures, and the complimentarity between Ordnance factories, public sectors in the Defence, and private sector, and R and D. The Reports were submitted to the Government. Some of the recommendations are yet to be implemented. Subsequently, core groups on material management and IT have been formed. Some more effort is yet to be put in. One of the problems that the Indian industries face is that the demand is less and there is a need to look for exports. We have regular interaction with the MoD and the Armed Forces. Lately, there have been developments with regard to rationalisation. Defence Procurement Board and a board on technology formulation have been established. A recent development is the decision to open Defence manufacture to private sector. To ensure its success, we have requested the Government to abstain from making a distinction between public and private sector – we discern a certain degree of support for the Government PSUs. If this happens the chances of the private sector coming forward would be remote.

In a meeting with the Defence Minister, we have indicated that while procuring major items for Defence from overseas, the message must be clear that purchases would be made from indigenous sources. The aim is to get into joint ventures with companies abroad and ensure purchase from such joint ventures.

One could ask, what is the road map of Defence purchases? Unlike the case of car industry, where one could conduct a survey regarding what the demand for motor cars

would be, in the case of Defence it pertains to limited, one type of purchase, and that too not completely transparent. Hence why would a foreign company come and give the know-how or invest in a joint venture with India unless they know what the demand pattern of the Government is going to be?

We have clearly stated that though we do not look for any commitment, the road map regarding the requirements must be made available, say, for a period of next ten years or so, in order to help us decide whether we will go for a particular manufacture or not.

If there is one thing that puts off the interested party, it is the payment system and the procedures as such. Defence will not be a priority with companies with other attractive customers. The payment is to be made simple. There is a certain degree of worry in the government regarding security aspects in that it should not fall in the wrong hands. Hence, whatever system is followed in the Government or Government undertakings – be it Ordnance factories or Defence undertakings – we can follow the same principles as far as the private sector is concerned. In order to maintain the safety of products, if there is need to follow any other system, we would consider that too. What is important in the ultimate is that whatever the system, it should be workable.

One has to also allow the development of the items that are imported at present. It has been generally felt that the private sector does not play its part regarding Defence manufacture. But then, the role of the private sector is essentially one of supplier of raw material, of components and parts. The private sector cannot make a dent in Defence purchases unless it is given the opportunity. But even to make such a dent in the purchases, the private sector has to import equipment; and Government policies do not permit that.

Here, it is also necessary to involve the users. At the moment, it is the MoD that makes the purchases mainly. Post Cabinet decision we have taken one team to the UK and one to South Africa. The visits will include some other countries too. However, apart from companies that are already involved in Defence production like Ashok Leyland, Larson and Toubro or Godrej, more companies should join the fray.

On its part, the DRDO is the apex organisation; they do the Defence R and D. It also plays a very important role in Government purchases. The private sector involvement in R and D is also minimal. One of the reasons for this is that even if an item is developed, the surety of an order for it is absent. One ordinarily takes a look at the weaknesses of the DRDO. But there are many achievements too. The private sector too has played its role in supplying items, and working for the DRDO to make this happen. But this involvement is small.

The weaknesses we perceive from the industry are that – in an era of fast changing technology, there are delays in project submission. Sometimes it is felt that the DRDO is overambitious and undertakes more programmes for development without taking into account its own capabilities, commitments and resources. We also feel that the DRDO ought to be more transparent and accountable. Sometimes we do not come to know the status of various projects that anyone dealing with the Defence would like to know about. Sometimes the opportunity costs are also not taken into account. Sometimes we develop items that may be available overseas; there are technologies that we cannot source from outside. One has to strike a balance between the two – what has to be indigenously developed and otherwise. The other problem for the DRDO is its inability to retain manpower.

We have been working with the DRDO for several years. Dr K Santhanam headed one of the Task Forces mentioned

earlier. This Task Force made several recommendations.

(a) There should be strategic alliance between the Defence technology developers and private firms with a good standing. Sometimes it happens that when you are involved with users - the latter might feel that we have already moved from whatever was being developed to something more modern.

(b) Partnership should be on a long term basis. On the part of the industries, there are certain responsibilities. We need to implement satisfactory physical, personal and information security procedures. The point that we have made to the Government and to the DRDO is that seek a partner who can deliver and who is dependable and sincere, out of the numerous industries available in India.

(c) There has to be a system by which the myriad technologies developed by the DRDO can be commercially exploited.

(d) Then we need to look into the sharing of costs between partners for testing, evaluation and clearance process.

(e) The Department of Defence Supplies and Production should establish or revitalise industrial R and D cells in selected production entities to effectively facilitate technological upgrades, absorption as well as participation in development and evaluation.

(f) Soon, we hope to develop an action plan for partnership with the DRDO. They have immense expertise but we need to see how we could justly work and take advantage of the facilities that they have.

Recommendations

(a) Rather than developing each and every item, the DRDO should focus only on critical items that are not

available in the international market because the technology is not available.

(b) The DRDO should invite competition in R and D. When we refer to competition between Ordnance factories, Defence public and private sector units; we are looking at a situation where even in the area of R and D, they could compete. The private sector would not have the resources to develop larger items; yet in some areas they could provide competition.

(c) We believe that the DRDO should change its role from development agency to R and D management agency. There is a lot of expertise available with industry. Between the private sector industry, and the DRDO, there should be partnership.

(d) We could perhaps have two private sector companies in an area needing development. The DRDO and the private sector could be helped to develop a particular item that is required, provided there is commitment of orders.

(e) The DRDO should consider involving the private sector for customising the product developed by them for the international market. One of the focus areas in the coming months would be on export. Looking at the demands within the country, I do not think there would be enough demand for the private sector to come in a big way to manufacture Defence items. We have to coordinate with the Armed Forces and the MoD to identify those countries to which these items could be exported. For instance, in case of tyres for MiG it needs to be seen where all the MiGs are operative.

(f) We have immense respect for the DRDO and we are hoping to develop a partnership.

CHAIRMAN'S REMARKS

LIEUTENANT GENERAL CHANDRA SHEKHAR PVSM, AVSM (RETD)

I would like to make a mention of the new Defence Management Structure. All problem areas of the DRDO and its inadequacies have been well recognised and documented by various task forces and committees. Consequent to the Arun Singh Committee, the Government announced the new Defence Management Structure. It has a Defence Acquisition Council at the apex level under Raksha Mantri (RM) with the Rajya Raksha Mantri as a member (RRM) as also the Services Chiefs and Secretaries of Defence , Defence Production and the SA to the RM besides, Financial Advisor to Defence Secretary and other members. This body at the top is being integrated. The DRDO has its own plans and the user has different perceptions. The three Boards are as under :-

(a) Defence Procurement Board with the Defence Secretary as its Chairman, Vice Chiefs of the three Services, VCDS, Secretary Defence Production, Secretary R & D, F A, Dy Chiefs and so on.

(b) Board for Defence R and D, chaired by the SA to RM who is also Secretary R and D Board. Defence Secretary, Secretary Defence Production, Vice Chiefs, VCDS, FA and others who have a stake are members.

(c) Board for Defence Production, chaired by the Secretary Defence Production. It has the same members as the Board for Defence R and D. A jointness has come about organisationally. There is an acquisition wing under Special Secretary Acquisition which has separate divisions - Land, Air, Maritime and Finance Systems.

The awareness that has set in is that Defence is everybody's business. The aspect being considered is whether we have the concept of integrated Project Teams (IPT) as in Britain and

France, where the whole thing is under professionals which combines the designer, the developer, the producer, the quality assurance and the user. Right from the time the equipment is conceived or given by the concerned Service and approved at the highest level, the budget allocated thereafter till death of the equipment - IPT continues to function. This is also believed to be a recommendation of the Committee.

DISCUSSANTS

Major General Ian Cardozo, AVSM, SM (Retd)

The benchmark of good governance is the security and welfare of its people. Defence security has many components; the one in focus is our capability to be self reliant in Defence production. Referring to the Indian Space Research Organisation (ISRO), Dr Santhanam stated that it was its own customer. One needs to assess who is the customer for DRDO. If the DRDO too is its own customer, then all ills that are there today in Defence demands can be laid at their doorstep. If their aim is to empire build or keep the Armed Forces out, the problems will remain.

The question is who is the customer? The Government or the Armed Forces Headquarters or the soldier in the field. The principles of war and the problems accumulated over the years remain. From the presentations made, I infer that the main strength of the DRDO is missile technology. It has also been mentioned that the MBT and the LCA are also its areas of strength. If one were to take the case of the Small Arms (SA) family of weapons, upto 1962, the Indian soldier fought with a .303 rifle only to be saddled with a 7.62 rifle. It took another two decades to decide that we needed a smaller calibre family of weapons. Today this family of weapons is available to the Indian Army but there are many problems. One wonders if it is fair to blame the DRDO and would it not be just to point a finger at the user – those who made the initial clauses. The principles on which the clauses were made were:

(a) It should be light weight; therefore, it was to be made of only composite material.

(b) The family of the ammunition should be the same.

But then the user would want an LMG to fire accurately at a range of 1000 mts and a sten machine gun to fire at a range of 200 m. When this was manufactured and used on a short barrel carbine, there was excessive flash, excessive sound, excessive recoil and inaccuracy. There are problems regarding composite material also, such as metallurgy, breakage, extraction, and magazine overheating resulting in stoppages. Now one does not know when these defects would be removed and who is responsible for all this.

One of the points neglected in the presentations is *accountability.* Not only the DRDO but also the people who make the qualitative requirements (QRs) are accountable. In the latter, even scientists are involved. We need to be more realistic, focussing all the way on what the user – the soldier – really wants. The Army, in the words of Lieutenant General S S Apte, has done nothing about it. There is apparently a laid back attitude with regard to proficiency in weapons and equipment. The Indian Army soldier, in the opinion of the American press , lacks everything except courage. This was the statement made by them during the 1962 War with China but it holds good even today.

Another case in point is the ballistic helmet - should it be less than 1.25 kg in weight and withstand a bullet fired from 5 to 10 m in range. What actually is required is helmet that can protect the soldier from fragments. There is hardly a casualty caused by bullet in the head; heavy helmets thus are not required.

A workshop is to be held early next year with the DRDO and the Services Headquarters as participants. It is to be hoped that they would sort out such problems with realism, pragmatism and transparency. I do hope the corporate sector would also be invited to take part in these discussions. They can contribute a lot to the betterment of self-reliance in Defence technology.

Air Marshal Bharat Kumar, PVSM, AVSM, (Retd)

The art and science of management was a gift of the Armed Forces to the civil sector. Unfortunately, the story of our quest for self reliance in Defence equipment is one of mismanagement and our failure to learn from past mistakes. Lieutenant General S S Apte has brought out the problems faced in the process of procurement from the internal resources, ie utilisation of existing and available technology and facilities. I would like to cite a few more examples to what he said. A few years ago, the Air Force required more than hundred basic trainers. It was decided to procure these from M/S Hindustan Aeronautics Limited (HAL) as the quoted prices were marginally lower than those quoted by the foreign vendors. Normally, the bulk order would have been placed with the foreign vendor but it was decided to place, initially, a small order with HAL and follow it up with more orders subsequently. The advantage from bulk purchases of components, undisrupted production, higher productivity as a result of benefits of learning curve, were all given a go by. This resulted in the Air Force having to pay thrice the initial price for the third lot of orders. The subsequent aircraft probably would have cost even more. It is not only the MoD which does not believe in following the sound business and economic logic, the industry is equally guilty. When the plan to manufacture MiG-27 was taken up by HAL, the original plan envisaged an uneven rate of annual production. That would have meant a large variation in the requirement of manpower for the task. It took considerable persuasion skills of the then Chief of the Air Staff to convince the MoD and the HAL that a steady rate of production would make better economic sense. As far as recasting of spares is concerned, the main criterion has been past consumption data. This is not a scientific method. The Chief of the Air Staff of the USA has gone on record that after a certain period, the cost of maintenance goes up by 10 per cent per year. The

spare consumption goes up after an item has been in use for some time and hence the enhanced requirement of spares. But since the forecasting is based on past consumption data, there is a gap with consequent effect on serviceability and availability of equipment for operational utilisation. To make matters worse, the MoD stopped sending the Air Force officers to the UK for logistics forecasting course from early 1970s onwards on the plea that the main source of supply is the former USSR which had no commonality with the British system of forecasting. We compounded the problem by not sending anybody to Russia; neither did we follow the Russian model nor accepted their recommendations in toto. How much do we encourage indigenous production and how willing are we to encourage the private sector? I would like to cite just one example. The Air Force required turbines for its air-conditioning system for the *Kiran* aircraft. A private manufacturer ventured to offer the same. His product went through the usual testing for a prolonged period and passed all the tests. The manufacturer's one time economic run would have met the Air Force forecast demand for five years but at a cost equivalent to less than our two year's requirements. The logical solution was to place the order on the firm and either keep the excess inventory for future use or dispose of the surplus abroad. The demand for the item existed and the item could have been easily marketed by HAL. But the MoD wanted to follow the easy course of either ordering from abroad or insisting that the local vendor supply only two years' requirements. I am not sure what ultimately happened as I left for my next appointment.

Lieutenant General M R Kochhar has stated that the DRDO is dedicated to progressive enhancement of self-reliance in defence systems and state-of-the art defence technologies. I do not think he or for that matter most of us are convinced about this dedication. Otherwise he would not have left to us the decision as to how impressive is the list

of achievements of the DRDO. In my opinion, the DRDO lacks accountability and has always tried to be too ambitious in its aims and too optimistic in its time and cost estimates. Notwithstanding its achievements, there have been too many slippages and their inability to deliver quality equipment in time and at competitive costs has led to the users' lack of confidence. The DRDO is a research and development organisation. It must not take on the job of the industry. And the Defence PSUs must stick to the time and cost frame. The Government's stand that we must place orders and wait for a few years more in the process in the interest of self reliance affects planning and operational preparedness of the Armed Forces. Dr Santhanam mentioned the rationale for creation of the ADA for the Light Combat Aircraft (LCA). This is against any other model in the world and cannot be justified. The responsibility for designing and manufacturing the LCA should have remained with HAL, with the DRDO developing those technologies that were either not available commercially or due to political reasons. As claimed by DRDO, LCA is not going to be inducted by 2005. Some timeframes are sacrosanct and there is no way that these can be short circuited. Let us be realistic.

We have followed the path of licence manufacture. This should serve as a stepping stone and we should be able to improve upon the product as the Chinese have done in a few cases. We also need to have two competent but independent design bureaus. This will ensure that the items on offer have the state-of-the-art technologies, but within our capabilities. Further cost estimates would be realistic and one would be able to compare. Mr Sen has suggested that the items in the civil sector should be developed by at least two firms and the order should go to the one with better design and lower cost. Similar should be the case with the Defence PSUs.

I entirely agree that we should encourage exports not only by the civil sector manufacturing Defence equipment but also by the Defence PSUs. M/s Dunlop had developed the technology for aircraft tyres and has been meeting the requirements of the Air Force. We not only did not encourage any other firm to compete with it but also did not allow it to export the tyres to other countries - there are more than 50 countries using MiG-21 and there should have been no difficulty in getting orders.

Self-reliance is a must but it is time we laid a solid road map for the same and then adhered to it. Ad hoc decisions would not get us anywhere.

GENERAL DISCUSSIONS

Wing Commander Vijay Raghavan

Why has the DRDO systematically sidelined induction of officers from the Defence forces? Is there a rethink?

Lieutenant General M R Kochhar, PVSM, AVSM (Retd)

I was in Service till a year ago. In many conferences I brought up this point of gradual denudation of Service representation from the DRDO. The Chief of the Army Staff asked me to prepare a paper on this and send it to him. This paper was then sent to the Scientific Advisor to Defence Minister. There was some discussion on this with the former also. As he was a busy man and with little time on his hands this matter remained where it was.

A decade ago I was in the MS branch. Those days there were 456 officers in contrast to 69 officers of the Services today. They will retire in the next four years or so. Nothing is being done about it.

Major General Ian Cardozo, AVSM SM (Retd)

It is not clear how the senior posts are going to be filled

unless we strengthen the base. The Chief of the Army Staff has very clearly stated that we would be willing to contribute officers provided the DRDO policy changes. The DRDO makes its own policies and gets them ratified by the Ministry; and this is incumbent on the Army. Majority of the 69 officers there today are doing administrative jobs rather than technical. So there are lots of posts for the non technical officers also. Some of the officers are on permanent basis and some on tenure basis there.

Both, the Chairman and myself had dealt with this problem 20 years ago.The policy is yet unchanged. The DRDO has ensured that officers of high rank do not come to the DRDO.

Mr Ahuja

During evolution of the Defence R and D and Production, there has been a weakness in that there is no agency for monitoring the transfer of developed stock to the production agencies in order to avoid time overrun. We need to have such an agency.

Lieutenant General Chandra Shekhar, PVSM, AVSM (Retd)

There is an agency under Defence production department under whom both, the PSU and the DRDO operate. The DRDO develops designs and it is transferred to the PSUs for production. However, the fact is that there is no proper monitoring. So it is left to the DRDO; sometimes the producer is brought very late on the scene. The design is outdated and the producer is not involved in the design or the development process. There is this lack of interaction. Overseas, it all comes under one project manager - the PMO - where he is a technocrat and a professional, selected for a particular duration; he has all authority - financial, design and production, including the factory.

In our case, sometimes the 'developer' is also the

producer. Sometimes the DRDO decides what to develop rather than the user who should decide that. The R and D plan is sometimes decided unilaterally. It should be done as a 15 or 20 year perspective plan in consultation with the Armed Forces and industry. On the contrary the unilateral decision is approved.

The Case of Army Radio Engineered Network (Plan AREN) by Corps of Signals has been a success story. A proper Project Management Organisation (PMO) was created and co-ordination ensured through proper integration and involvement. Subsequently, a similar procedure was followed for fielding of Army Static Communications Network (ASCON). We have a case where an individual project was placed under the General Staff. The required amount for the project was sanctioned. Many production agencies were associated with it right from the start. Transfer of product was also managed well.

There are exceptions to such cases. On another project named 'Samyukta', the DRDO undertook the monitoring. There are such instances where integration remained a concept and not applied.

Lieutenant General SS Apte, PVSM, AVSM (Retd)

I would like to touch upon the matter of quality assurance. There are delays in the clearance of samples and bulks due to inadequacy of vendors on whom the orders are placed at the lowest rates. This is done ignoring technical deficiencies and with the additive of harassment by the Quality Assurance (QA) representative. The placement of Orders should in fact be on competitive vendors alone and the procedure needs to be streamlined by the Directorate General of Quality Assurance (DGQA). Quality cannot be compromised.

Lieutenant General Chandra Shekhar, PVSM, AVSM (Retd)

In the case of certain developing agencies, it becomes difficult to transfer technology or the details of drawings to the production agency. Consequently, the production does not take off smoothly.

Most of what has been mentioned in the session today, have been success stories. Production agencies will not attach much importance to a product unless there is adequate benefit accrued from it. The agency must be given the wherewithal, and the incentives to do the job.

Commodore Ranjit B Rai (Retd)

All is not pessmistic where the DRDO is concerned. When it was realised that the Navy had become monolithic considering the way the bureaucracy works, the Navy decided to help itself, it developed the WASSEE which is the weapon engineering equivalent of DRDO. Navy also used WSSF, DWP, NPOL, LAIO and NSTL.

As far as Naval Armament Inspection Organisation (NAIO) goes, once the Navy decides to buy an equipment, the NAIO is involved. As of now, the Navy is handling more weapons systems and more equipment than the Army or the Air Force. The failure rate is minimal. There is no limit to what the DRDO can do. However, there are too many senior scientists and not enough workers.

On the matter of scientists moving away to the US; it should not be a matter of concern. The person below him should be able to take on the mantle of authority and responsibility. If he has learnt from his senior, the junior man would not cause any worry when the senior man moves away to greener pastures. India has the brainpower.

Regarding partnership in production, when Singapore

expressed keenness to build half of the LCA (Light Combat Aircraft) there with the other half to be built in India, the suggestion was negated by us. India wished to build the LCA on its own; the CII (Confederation of Indian Industries) on its part is more inclined to help only the Indian companies. Maybe if the Armed Forces were to seek foreign partners for their products development and were to take away production from the DRDO, pending products may see light of the day?

Lieutenant General Chandra Shekhar, PVSM, AVSM (Retd)

It has been mentioned by the speakers that the DRDO is a monopoly despite its success with the Navy. But any multinational participation necessitates a change in our policy approach. Even the indigenous industries are unable to make inroads in the Defence industry sector. Most of the Defence equipment items continue to be on the restricted list.

Shri S Sen

The Government's foreign company policy does permit a 26 per cent equity from foreign companies. In order to avoid delays in items development there is no harm in obtaining foreign involvement in developing those items. Around 70 per cent self-sufficiency is said to have been achieved. But even in this, some indigenous items may have imported components. A major drawback of the Indian industry is that it has not gone in for R and D.

Shri Chandra Mohan P

Given the scope for public and private sector partnership in Defence production, do you contemplate a conversion of Defence industries in India? Is it possible to convert some of these production facilities to alternate commercial uses?

Shri S Sen

What kind of partnership could be brought about

between Defence undertakings, Ordnance factories and the private sector? The Ordnance factories have a lot of expertise and a lot of facilities which could be used by the private sector. The question is of how each other's facilities can be used.

Lieutenant General SS Apte, PVSM, AVSM (Retd)

A day may come when there would no more be a purely Defence/Government factory.

Lieutenant General MR Kochhar, PVSM, AVSM (Retd)

India has seven Army base workshops, some of which overhaul tanks. The number of guns and tanks that we overhaul is of Russian origin and technology. There are a lot of countries using East European equipment but with no facilities to overhaul them. When they turned to us for overhauling, we refused as a matter of policy. There could have been no loss of secrecy if we had agreed. All that we would have gained was foreign exchange.

Major General YK Gera (Retd)

It has been often pointed out that concentration should be more on critical items where foreign collaboration is concerned.

Lieutenant General Chandra Shekhar, PVSM, AVSM (Retd)

When was the Kaveri project launched? What is the original and latest probable date of completion (PDC). What is the main hold-up?

Lieutenant General M R Kochhar, PVSM, AVSM (Retd)

The engines that have been tried have run for 1000 hours. There has been no problems with them.

Vice Admiral S C Chopra, PVSM, AVSM, NM (Retd)

I wish to cite an example of synergy in the Navy. The Naval ship design bureau is part of the Navy. All

professional Directors are involved from the conceptual to preliminary details. At production level, the DSP and others are involved. From patrols boats to carriers and submarines this synergy is there for the Services to emulate.

The Kaveri project did not progress due to lack of sponsors. The Services - the users - have to be involved. Further, until the private sector fully comes into the picture, it is upto the Services to ensure restraint or an absence of any bickerings that take place

Lieutenant General Chandra Shekhar, PVSM, AVSM (Retd)

The environment in the Navy is different; the work is concentrated in a shipyard. But in the Air Force, the variety of equipment is vast, making it difficult to get everything together. In the Navy, the systems and R and D are different; the Quality Assurance is integrated and under control. The Army and the Air Force do not have it. Navy has adopted the management techniques better than the other two Services including the inventive management, forecasting design and so on. This synergy is important.

Vice Admiral PJ Jacob, PVSM, AVSM, VSM (Retd)

We have much more synergy because we realised that a project cannot go ahead unless the user is associated from the very beginning. Ship building projects have been a success; so too the systems integration. Wherever the Navy has actively steered projects at the highest level, the projects undertaken by the Navy have all done well.

The Integrated Logistics Management Systems (ILMS) pioneered by the Navy is gradually delivering the goods. Things like stock levels, first-in-first-out, mean-time between failures, are inputs from the Indian Ship Maintenance Authority, which go into the ILMS system. Where logistics is concerned, we have moved far ahead. This is certainly a model that can be looked at by others.

Colonel Mukherji

Of all the arms and services in the Army, the Engineers are by far the most indigenisd. Around 97 per cent of requirements are locally manufactured. This is possibly so because the technology is mid-level to low-level. One of the best bridges in the world is credited to the engineers of the Indian Army because the CME and R and D engineers were co-located in one station.

The R and D sometimes has to be the production agency also. In the construction of the Sarvatra Bridge, the partners in the project had development lessons from the AM 50 bridge that was reverse engineered. Each of the partners provided something to the final product. The R&D, however, is holding on to a few of the major firms that are from the private sector, and they have to be given a share of contract when finalised. This will not happen in an open system.

Lieutenant General Chandra Shekhar, PVSM, AVSM (Retd)

Wherever there is jointness in a test at hand, success is assured. It is never a question of who is in control of it. It all rests finally on integrated management, central decision-making, earmarked and dedicated finding, and clearly spelt out targets. When put together, you get exactly what the IPM system (Integrated Project Management) is. We have to make use of the infrastructure which has been built over the years. What we require is a flexible approach with no compartmentalisation of the DRDO, the PSUs and so on.

PARTICIPATION OF PRIVATE SECTOR / INDUSTRY AND IMPACT OF TECHNOLOGY, INCLUDING DRDO, IN DEFENCE PRODUCTION

SECOND SESSION

Chairman : **Air Mshl Vinod Patney, SYSM, PVSM, AVSM, VrC (Retd)**

First Paper : **Maj Gen DN Khurana, AVSM (Retd)**

Second Paper : **Vice Adm AC Bhatia, PVSM, AVSM (Retd)**

Third Paper : **Dr CG Krishnadas Nair, Former Chairman HAL**

Discussants : **Air Vice Marshal Samir K Sen (Retd)**
Cmde HS Punia (Retd)

AIR MARSHAL VINOD PATNEY, SYSM, PVSM, AVSM, VrC (RETD)

CHAIRMAN

The subject for the second session, "Participation of the Private Sector/Industry and Impact of Technology, including DRDO, in Defence Production", is significant in its own right. To present their papers on this subject, we have a panel of eminent speakers – Major General DN Khurana, who is the Director General of the All India Management Association, Vice Admiral AC Bhatia, with a distinguished service in the Navy and Dr CG Krishnadas Nair, former Chairman of Hindustan Aeronautics Limited. Air Vice Marshal Samir K Sen and Commodore HS Punia are the two Discussants.

SECOND SESSION : FIRST PAPER

MAJOR GENERAL D N KHURANA, AVSM (RETD)

There has been for long a desire to achieve self-reliance in military hardware. However, constraints of technology and resources have prevented the process from fructifying to the extent desired. Also, for all these years, the Services have been dependant on Ordnance Factories (OF) and Public Sector Undertakings (PSUs) to produce a wide range of Defence equipment. Undoubtedly, much has been achieved in creating a large infrastructure for Defence production in these government sectors.

These ordnance factories were primarily set up to manufacture lethal and non-lethal equipment and items, specifically to meet the needs of the Services, and were not set up as commercial ventures. Further, they were conceived at a time when corresponding industrial support and available technology could not meet the requirements of Defence. The common belief is that these OFs have not kept pace with the general developments in the industry. They are believed to employ archaic and manpower intensive techniques, which give them very poor productivity. There are delays in deliveries, inaccurate price structures, and mismatches between capacities and affordable levels of orders. With excessive number of employees (approximately 1.5 lakhs) and outdated machinery, they are being maintained at disproportionate cost-benefit ratio.

A lack of technological upgradation, an absence of competition and an assured customer has now brought their very existence into question. The management of some of the existing PSUs is generally neither professional nor competent.

Developments in the last decade, i.e. disruption in military imports due to break-up of the Soviet Union, demonstration of advanced technologies in the Gulf War and

the concerted efforts of developed countries to impose restrictions on technology and weapons transfers have further highlighted the fact that we make a deliberate effort to achieve self-reliance in as many military technologies as we can.

The Gap

The fact that India's Defence equipment requirements are being met largely by imports confirms the existence of a large gap between its requirements and the ability of the industry to meet them. Our industries are unable to provide these systems because the technologies required for fabricating them are not being developed indigenously. Therefore, the first gap is in the field of *technology*.

The second gap to be bridged is in the area of *manufacture of weapon systems*. The constraints are many - poor interface between R and D and manufacture, inadequate infrastructure to fabricate high tech military equipment, economies of scales, poor quality and insurmountable procedural impediments. Together, these constraints inhibit the Indian industry from enthusiastically participating in the Defence production process.

While there has been a deterioration in the material support from PSUs and OFs, the civil industry has built up expertise in technology. It has grown in size and reach. It has acquired modern manufacturing technologies and resources and there are positive signs of a vibrant economy. It has gained enough confidence to make a meaningful contribution towards Defence.

The private sector, therefore, merits a rightful role in national defence. We have been rather slow in realising that in order to have an appropriate level of security without incurring too much expense, Defence production and production in the civil sector need to be blended. And for this, there is need to build a long-term partnership with the private industry. This partnership should be of a permanent

nature in a manner very different from what we are used to so far. This will require a major attitudinal change in our approach towards the private sector as also to the very concept of defence to recognise that Defence is as much the business of industry as that of the military and the Government. It must be realised by the Services and the government that business seeks reasonable returns on their investments; profit is no more a dirty word.

The vision of this partnership should be to create a self-reliant Defence-industrial base for the country and place India in league with leading military-economic powers by the middle of the Twenty First Century.

The Strategy and its Components

This vision will need to be supported by a well chalked out strategy to achieve our goal of self-reliance in Defence systems so as to achieve a reasonable amount of indigenisation in the next 10 years or so. To implement such a strategy will require a common approach which would need to :-

(a) Identify the requirements of Defence Services.

(b) Identify technologies that have commonality with civil usage.

(c) Identify segments of industry that have a commonality.

Some other components of the strategy are :-

(a) **Defence Requirements.** For the industry to invest and participate in defence production, it would require inputs from the Services in terms of what its requirements are; the quantity and the quality, and for how long. These inputs should be based on Services Perspective Plans and made accessible to industry. Technology requirements should span a period upto 10 years in the medium term and 20 years in the long term.

(b) **Forecasting.** Services' projections should be pragmatic and based on scientific forecasting techniques. Present and future capabilities of indigenous R and D and manufacture as also realistic budgetary allocations need to be taken into account. Sound forecasting will facilitate regulated production, better utilisation of capacities, cost control and ultimately a cooperative relationship between Defence and Industry. A sense of accountability can be induced into forecasting if industry is compensated for major variations in demand. This would also ensure a more realistic Perspective Planning within the Services.

(c) **Time Schedules.** Long term contracts with time bound delivery schedules are essential elements of mutually beneficial partnerships. Such contracts facilitate firm investments by the Industry. Time bound delivery will enable the Services to induct the equipment smoothly and cater for training and operational planning. Penalty mechanism for breaches in delivery schedules should be stated unambiguously. At the same time, compensation to Industry for changes in demand from Defence should also form part of the contract.

(d) **Specification.** Specifications play an important role in the success of a development project, speed of manufacture and, ultimately, the product cost. Streamlining the process of formulating military specifications and communicating them to industry would play a positive role in building the bond between defence and industry. Alignment of Defence standards for non-critical items with the BIS, commercial, industrial grade equipment needs to be identified and evolved amongst the three Services. However, by placing our requirements far higher than what the industry is capable of delivering, we have had situations where the upkeep of the equipment, its maintainability and sustainability

have generally left much to be desired. Services should, therefore, streamline the process of formulating military specifications and communicating these to the industry.

(e) **Adopt Commercial Standards.** As far as possible, commercial standards, specifications and protocols should be adopted for Defence equipment.

(f) **Sector-Specific Environmental Specifications.** Even for military specific items, two separate sets of environmental specifications could well be identified. One set for cold and high altitude regions and the other for hot and humid regions. This would greatly simplify the design and fabrication process.

(g) **Standardisation.** In the past, diverse sources of supply of imported equipment hindered standardisation of military equipment. Consequently, as the quantities and types of equipment in use increased, so did the requirements of spare parts and qualified maintenance personnel, which resulted in inventories growing in magnitude and complexity. Spare parts availability became a problem because of the varied makes and models and the resultant lack of interchangeability among their parts. Other than specific weapons and equipment systems, we should encourage commonality to the maximum, particularly where vehicle fleet and transport aircraft are concerned. As indigenous production increases, the tendency to lose focus on standardised military equipment becomes greater. Coordination between Defence and civil standardisation organisations should be strengthened.

(h) **Avoid Duplication.** We need to examine whether we can avoid duplication of facilities where we could well use the available civilian facilities. For example, is it not possible for the Services to use vehicle repair workshops and overhauling facilities created by reputed

suppliers of international standard commercial vehicles? Do we need to have our separate facilities even when they have proved to be expensive and not up to the mark? Surely, the industry can look after our Ambassadors, Leylands and so on wherever these facilities are available. Of course, we will need to have repair workshops in remote and operational areas. Similarly, should Services really be manning huge petroleum depots in places like Delhi and Mumbai ? We could probably identify many such areas like holding of huge reserves of batteries, tyres and tubes which could be assigned to the civil trade who could be asked to supply certain quantities when given specific and advance notice. Trade will have to be bound to meet these needs either by enhancing their capacity or cutting their exports and supply to the market. A foolproof arrangement needs to be made. Perhaps it is worth the try.

(j) **Quality Assurance (QA)** : At present the delays in clearance of bulks take place, both due to inadequacies of vendors on whom the orders are placed on the basis of lowest rates ignoring the technical deficiencies, as well as due to harrassment by QA representatives. While the procedures should be streamlined by the DGQA where warranted, placement of orders should be on competent vendors only. There is no gainsaying that assurance of quality is fundamental to building product confidence in the user. Quality cannot and should not be compromised.

POLICIES AND PROCEDURES

Formulation and implementation of policies and procedures within the Government, Defence Services and the Industry, is the core issue that influences every aspect of developing a viable long-term partnership between Defence and Industry.

Procedures. Industries get frustrated by our procedures which are complicated and time consuming. They do not have the time and patience to wait in the corridors for bureaucrats. We need to modify various facets of existing procedures used by the Services while dealing with private sector. Some of the aspects that need review are :

(a) Procurement procedure needs to be made more flexible, transparent and efficient, and attractive to industry.

(b) Considerable improvement is required in vendor registration and tender procedures.

(c) We need to reduce the decision making layers. If industry is to be attracted to participate in Defence production in any meaningful way, the stumbling block of multi-layered decision making system, culminating in narrow channels at MoD and Service Headquarters needs to be eliminated. These should be reduced to the barest minimum necessary for ensuring checks and balances. The two areas that would facilitate this are :

(i) Delegation of authority to and enhancing financial powers of procurement agencies in the Services.

(ii) Integration of the decision making channels of MoD and the Services.

(d) We should introduce single window system for permanent needs.

(e) As mentioned earlier, formulate a clear policy on procurement of COTS (commercial off-the-shelf) products.

(f) Streamline our testing procedures. We have a monolith organisation, the DGQA, where even commercially proven products are subjected to many trials and tests.

Encouraging Healthy Competition

With reducing budgets and need to keep up with technological advances, the Defence Services are forced to look for better products at affordable prices. Competitive prices in a "level playing field" is the only option that can ensure cost effective procurements. The price and purchase preference being extended to OFs and DPSUs should be done away with to equate public and private sectors. This step would encourage healthy competition, result in lowering of prices and encourage public sector industries to become more efficient and not exploit the captive markets.

Separate Procurement Procedures

For long, procurement procedures did not differentiate between products in terms of their cost, quantity and nature. Basic procedures remained the same be it the purchase of a tank or a tomato. There is need to review this. Minor and low cost items – consumables, minor spares and medicines, for instance – should logically have a simplified and quick procedure. Major or costly equipment and supplies could have a more deliberate method.

There is also a need to evolve procedures that emphasise "value" rather than "cost" pricing. Existing procedures do not help in exploiting the full potential of the industry.

Policy on Procurement of COTS Products

Defence needs to review some of its procedures to enable greater use of COTS products. A broad policy needs to be enunciated for this purpose. The core of this policy should contain the following features :

(a) Products with fast changing technologies – like IT hardware / software – should be procured off-the-shelf.

(b) Military specifications should match commercial specifications for most common user items.

(c) Minor modifications to specifications, to meet specific military requirements, could be made. These should be restricted to reasonable increments in prices and without modifications to the manufacture process.

(d) Ruggedisation of COTS products could be dispensed with. In-built redundancies can be created by taking advantage of lower cost of COTS products.

(e) Maintenance support should be provided entirely by the trade.

Partnership through Dual Use Products

Dual use products are those products where either only the Defence has high demand or where both the Defence and the civil sector have low demand. Partnership is likely to be more successful where Defence and industry needs are complimentary. Dual use technologies and products should form the core of the partnership between Defence and industry. The US and Western military-industrial complexes are gradually converting to dual use industries. India's path to self reliance, on the other hand, should be to create a Defence industry , with its foundation on dual use products. Partnership based on dual use strategy could be all encompassing. It should include :

(a) Dual use research, product design development and financing.

(b) Dual use equipment and manufacturing plants.

(c) Dual use maintenance support.

TECHNOLOGY AND RESEARCH

Many technologies developed for military purpose can be applied for commercial use and vice-versa. The same applies to R and D facilities in the DRDO and industry. A strong bond can be created between industry and Defence through sharing of technologies and R and D facilities

developed by each other. A policy and mechanism to facilitate this process should be formulated and implemented at the earliest. A positive step has already been taken by the DRDO by opening up some of its laboratories to the industry. This needs to be institutionalised through reciprocal action by the industry.

A major issue that the industry finds discouraging is that a firm, which participates in a successful research project, is sometimes denied the fruits of its efforts. Contracts for production are given to some other firm – often a PSU – simply because someone else quoted less. A provision should be made in the research contract or agreement for a guaranteed minimum supply order to such firms.

THE INTERACTION MECHANISM

Service Level and National Level Integration

There is a need to foster closer interaction with private sector at the Service Headquarters (HQs) level and the national level. We could consider having a Service-Industry Partnership Core Group at each Service HQ possibly chaired by the deputy chiefs with representatives from Procurement Agencies, MoD (Finance), and Industry. The interaction between Industry and Service HQs must commence at the planning stage, i.e., when Operational Requirements (OR) and GSQR are being drafted.

Equally important is the need to have an agency at the national level to coordinate the Defence needs with the country's 'civil end' requirements. It will be desirable to have a system whereby the industry is informed at the earliest of the requirement of the Services, of course, with a confidentiality clause. It has been clearly demonstrated that wherever this has been done, the overall progress has been fast and phenomenal. It has encouraged faster adoption of newer technologies and helped industrial growth. Such

coordination will lead to efficient and economical material support to Defence Services. Logistics cost a lot of money; they involve industry, manpower, raw material and virtually every walk of life is affected. By making military needs as the basis for our technological and industrial advancement, we can have competent Defence along with development. Perhaps there is a need to have a "National Logistics Grid" as someone has put it. This will require the Defence taking the civil sector into greater confidence. We need a national policy on industry with identifiable defence usage, wherever applicable and possible, and then make a core group to undertake the process of amalgamating Defence and development in a time bound manner. This will ensure that industrial capabilities are built in a way that it provides both the material for war and meets the needs of the country's population.

Perhaps we need to consider having a National Logistics Council with the Defence Minister as Chairman, representatives from all the three Services, Finance Ministry, Industrial Development Board, Department of Science and Technology, DRDO and representatives from the industry.

Let us not make too much fetish of secrecy. The planning of production and supplies need not be treated so.

Conclusion

I have tried to build up a case for a long term partnership between Defence and Industry. However, this partnership and cooperation can be strengthened if there is mutual understanding of each other's strengths and weaknesses. A deeper insight into each other's strengths and weaknesses is essential. Some of the major areas of strength are :

(a) The government and the Services are genuinely committed to achieving self-reliance in Defence production through greater contribution from the Indian Industry.

(b) The DRDO has acquired wide ranging research capabilities to meet indigenous design and development of Defence equipment. This needs to be augmented by the Industry.

(c) The OFs and DPSUs have a large established infrastructure with decades of experience in licensed manufacture.

(d) The private sector has built up the core competence in manufacturing technology and is absorbing advanced technologies in a number of areas.

SECOND SESSION : SECOND PAPER

VICE ADMIRAL AC BHATIA, PVSM, AVSM (RETD)

In the section dealing with the role of private sector, the MoD Report for 2000-2001 says "in view of the long gestation period, and fluctuating demand for defence stores, it was decided that the lead role in this field has to be taken primarily by the public sector. The private sector has also been involved, mostly as sub-contractor to Defence PSUs and OFs for raw materials, semi-finished products, components and sub systems."

The question before us is whether the private industry can take on a bigger role and if so how? Can they now be expected to make long term investments to enhance the range of the items and also take on development of high technology equipment? Is DRDO ready to transfer technology from its laboratories to private sector? Can we trust the people in the corporate sector with information in the same way as we do with those in the public sector? These and many allied issues need discussion.

The MoD Report also says that the Supplies Wing has been continuing its effort to develop broad- based indigenous supply sources both in the public and civil sectors for complicated and intricate equipments. It is also their policy to develop more than one source for each item. The department is maintaining permanent sample rooms in the four metros. For continuing enhanced and meaningful interaction, conferences are held, and 16 exhibitions cum vendor awareness programmes with the DGQA's participation were held. The value of *ab-initio* development of orders on private sector has risen from Rs 60 crore in early 1980s to Rs 200 crore in the 1990s and Rs 278.58 crore in 1999-2000.

Coming to DRDO-Industry interaction, eight laboratories were opened to the industry last year. The developments are

canalised through the Confederation of Indian Industry (CII). Since September 1999, the DRDO has transferred 21 fields to the private sector. These include scara robotics used for assembly jobs, NBC (nuclear, biological, chemical) equipment, anti spark tools from Cu-Ti alloy, tents glacier and instruments used in surgery. We can see this field expanding in the near future.

The break-up of the Soviet Union and the foreign exchange crunch in the mid 1980s and early 1990s highlighted the strategic implications of dependence on foreign sources for critical technologies. It was made worse by the efforts of the developed countries to impose restrictions on technology and weapon transfers. Self reliance was thus an imperative and to this end Self Reliance Implementation Council (SRIC) was set up in 1995. This council has set its aim, as planned, to increase the share of the indigenous industry from 30 to 70 per cent by 2010.

It is realised that government supported R and D and manufacturing facilities are getting increasingly inadequate to meet our requirements. Private industry has grown in size and reach and has acquired modern manufacturing capabilities and resources to compete with DPSUs and OFs. It is an accepted fact that the time has come for the private sector to be given a rightful role. It is imperative to involve the private industry in defence technologies and manufacture by building an enduring partnership between industry and Defence.

The SRIC is of the view that the partnership is a joint effort to achieve higher goals; a sharing of ideals and goals. It is their view that this partnership has to go beyond Defence production. A much larger perspective, vision and goal beyond procurement and quick profits could create a self reliant Defence industrial base for the country, which will place us among the leading military economic powers by the

middle of this century. To forge such a partnership it is envisaged that :-

(a) Defence is everybody's business; be it the industry, the military or the Government.

(b) Defence looks for quality products and industry expects reasonable returns on its investments.

(e) Finally, in any relationship, mutual trust and benefit form the bedrock on which a partnership is built.

It would be appropriate to say that our warship construction is one of the finest success stories of our country. In 2000, I was in the US during the visit of INS *Mysore* and saw the pride with which the NRIs saw the ship. No doubt our design organisation and ability to absorb technology , as also reverse engineering, have excelled but credit is equally due to the private sector industry who have contributed. Diesel engines, generators, motors, steam turbines, switch boards, pumps of various kinds and capacities, submarine batteries, airconditioning plants, gear boxes are but a few examples. These items met the stringent specifications. Suffice it to say that our private industry has already made a mark in warship technology.

With this background the next step would be to identify existing strengths and weaknesses of the private sector. To establish a long term partnership, it is necessary to identify our requirements and then the industry's capability to meet them, for now as well as for the future. The fields will include military technologies, weapon systems, equipment and stores. The industry will have to field its capabilities in R and D, manufacture and product support facilities as well as its financial, infrastructure and human resource base. This endeavour requires that advanced technologies be developed through a distributed research including participation by MNCs (multinational corporations) and established

manufacturers. Such collaboration will give us a higher take-off point and shared costs.

Let us have a look at the contemporary scene from the point of view of the industry. Our industry is now stronger and versatile and willing to enter new fields, including Defence. Our rules have also evolved to give a reasonable chance to the industry to amortise its investment. Once a development order has been executed, the next repeat order of equivalent quantity has to be placed on the same firm. The second and third orders too have to go to the same firm, for at least 80 and 50 per cent respectively of the original order. This system is fair to the developer. The critical factor is that the quantity in the first order has to be estimated objectively.

Technology and specifications are inter-related. In the exacting environment in which the systems are required to function, the users tend to lay down stringent specifications. There is a tendency to ask for the best feature in every parameter. This not only raises costs but also makes it difficult for the industry to meet our requirements. There is thus a need to review our specifications and use dual use technology and where possible, commercial off-the-shelf specifications (COTS). This will be a way of building capability at an affordable cost. This will also avoid *ab initio* development in those areas.

One can go for COTS, but only after a careful study of the function and criticality of the item. For example, only about 5 to 10 per cent of the Army vehicles are required to ply on a gradient of 15 degrees in rough terrain but to specify such a requirement for all vehicles including staff cars is unreasonable and expensive – ordinary vehicles serve the purpose; of course, we have to make provision for the star plates and flags! On the other hand, there are some critical components whose failure can result in catastrophe! So a compromise is difficult there.

Another factor that the industry has to contend with is the rapid obsolescence. The other side of the coin is the rapid developments in technology. The users naturally want to upgrade the equipment in step with the contemporary. This factor can be seen in case of *Leander* class frigates where every successive ship was fitted with different but upgraded equipment. In fact, in the field of electronics, it is necessary to update equipment every five years. For the industry, it is difficult to cope with such changes. Among other factors, such upgradations reduce the numbers and quantities on orders and raise costs. Once again, this leads us to the need for adoption of dual use technologies in surveillance systems, communications, advanced materials, manufacturing,' simulation and modelling.

There may still be some hesitation to involve the private sector in a larger role. In fairness, let us now look at the performance of Ordnance Factories, DRDO and DPSUs. The DRDO has achieved great heights in case of APSOH and HUMVAD sonars, Panchendra tactical system and host of electronic sub-systems. I have already talked about the shipyards but the balance-sheet is not all in the plus and in many fields, these three organisations have not lived up to the expectations. The OFs did not even have a concept of costing till recently. Technology update was carried only in a few cases. Even for fabrication of uniforms, the Navy had to opt for local fabrications to avoid ill-fitting and sloppy uniforms from the OFs. As for ship-building and even refits by our public sector shipyards, there have been inordinate time and cost overruns. Construction of our fleet tanker, Aditya, at Garden Reach in Kolkata went on for years. The unions in that state have their own norms for output and the management was helpless. What has recently been in news is the Barak system for the Navy. The Navy was compelled to import the Israeli missiles only when our DRDO and PSUs failed to deliver the first choice, Trishul, in time. Another

example comes to mind from the Coast Guard for periodic inspections of the Dorniers. It was the practice to send these aircraft to HAL at Kanpur where, against the norm of three months, it would take upto eight months to complete the task. The Coast Guard observed that a commercial organisation, Air Works India, had a record of zero time overruns for the same job. It entrusted the job to Air Works who met the target everytime at comparable costs, thereby improving the operational availability of the aircraft by a factor. It is high time that we break away from the holy cow of the public sector.

Confidentiality is a sensitive issue to deal with. There are patriotic and trustworthy Indians in the private sector and conversely there are some black sheep in the government's own teams as well. In every contract there can be a binding secrecy clause with penalties under the law. When entering into contract with foreign firms we sign a secrecy clause. Surely we can do so with our own countrymen also.

It is clear that the private sector has to play an ever increasing role not only in the industry, but also in development of sophisticated technologies. As is known, in the West, much of the research is given to laboratories in the private sector and it is the practice to appoint specialist officers to assist in the projects. We will have to do the same. We have to nurture the industry by providing them with technical assistance and advice, rising above the present role of inspectors and fault finders. Looking ahead, as Informtion Warfare is likely to play an important role, IW or C^4ISR will present the challenge. The common factor in all these fields is software and this is the field where our private enterprise has put our country among the world leaders, without any help from the government. In the Defence Services, we have to build a partnership with the software industry and that will give us a decisive lead in these critical fields.

SECOND SESSION : THIRD PAPER

DR CG KRISHNADAS NAIR

Introduction

Immediately after independence, the Indian Government set up a large number of public sector industries in the core and strategic sectors to establish self-reliance as well as to develop a strong industry based economy for improving the economic growth of the country. The Ordnance factories and the Defence public sector industries grew over the years contributing significantly in the production and maintenance of Defence equipments and enhancing self-reliance in this area. Strong in-house research and development were established in many of the Defence public sector undertakings and this together with the Defence R and D laboratories in the DRDO working closely with other national laboratories, have greatly enhanced self-reliance in R and D of technology and design and development of the equipments.

With the liberalisation of the economic policies and opening up of Defence production to private sector, there has been considerable efforts on the part of Defence services, Defence public sector undertakings, ordnance factories and DRDO through seminars, discussions, exhibitions and workshops to involve private sector in Defence production. With the growing need for development, production and maintenance of Defence equipments and for availability of timely services, there is considerable need for indigenous private sector industries to complement the efforts of defence PSUs, Ordnance factories and DRDO laboratories.

While the public sector industries are fully owned by Government and, therefore, by the people of the country, the private sector industries are those in which the government share is less than 50 per cent. There are several private sector industries with little or no share from Government. While share in many private sector companies are held by either

Indian citizens, institutions or trusts and in some cases overseas organisations, majority of the shares are subscribed by the public, ie the citizens of India. Thús, even the private sector industries are by and large owned by the people of the country and, therefore, the private sector industries have a legitimate role to play in building up self-reliance in Defence.

There are hesitations on the side of the private sector as well as the public sector. There is need to understand these and take necessary actions and motivate the private sector industries to play their legitimate role in Defence production and also motivate the Defence public sector undertakings and other organisations to provide the necessary support in this endeavour.

High efficiency and high speed models need to be evolved in the participation of private sector for effective interaction, decision making and management. In order to make production economically viable and to open up global market in the private sector, certain policies may have to be adopted by the Government to help export of indigenous products. Some of the Defence public sector undertakings, Defence Research and Development Organisation (DRDO), Directorate General of Quality Assurance (DGQA), Directorate General Aeronautical Quality Assurance (DGAQA) and Society of Indian Aerospace Technologies and Industries (SIATI) are already playing a major role and their efforts need to be augmented. The Society of Defence Technologists (SODET), formed under the auspices of the Ministry of Defence production recently, can also play an important role in the future.

From a purely economic production point of view, the quantities required are small except in few cases. These requirements are also not continuous, but keen on fluctuating. With an increase in threat perception there is an increase in demand; otherwise it tapers down. If a private sector industry

has to compete for development and production with established overseas suppliers, there is always a risk of loss due to the long gestation of development time and efforts and the high cost of amortisation for the small batch quantities. Added to this is the stringent quality requirements, which are very essential. As the quality and reliability in service are of utmost importance, the testing procedures are elaborate and stringent and will take time and there cannot be any compromise on the same. The private sector is not very keen to make investments and wait for a long time to get acceptable returns on investment. This is not to say that the private sector is interested in profitability and public sector is not. Today public sectors are running as commercial organisations; they have to make profit and provide an acceptable return on investment to the shareholders and many are doing well in this respect. However, it is a fact that initial capital investment came from the Government, which could afford to wait for a long gestation period.

The private sector is also concerned with the procedures of tendering and of not getting consistent orders even when there is an ongoing requirement. As per the current purchase procedures a vendor is selected for development and supply of an item based on commercial tendering and the lowest tender is selected. Although this first vendor risks and invests in capital and efforts to develop and supply the item to the customer's satisfaction, subsequent batch or bulk requirements are not exclusively tendered to this vendor. The customer again resorts to normal tendering and the first party has to again compete with others in offering a quotation. While the first party has spent lot of time and money in developing the product and producing the same and is to amortise the cost of development, the new comers may sometimes avail the benefit of technology leaks which are rampant in our system and can quote a lower price. The manufacturer has to disclose key data regarding the

development and process employed in production to the certifying authorities. The human chain within these organisations as well as in the vendors organisation can become a source of leak. There are instances where a competing private sector has bought people from another private sector who has originally developed the item, got the benefit of full technology and, therefore, could quote a much lower price. Under such circumstances where there are no guarantees for the original private sector industry to get continuous orders and with all other constraints there is a valid reason for reluctance in investing in Defence production.

The user has some fears about sustained supplies and services from the private sector. The user fears that the private sector may dump Defence production and go for more profitable items as and when the opportunity arises and divert his facilities. There is also a fear regarding the continuous maintenance of quality and upgrading the quality of products and services. There is also greater confidence with respect to DPSUs and Ordnance factories as these are owned by the Government; confidence building has been going on for long. Many of these organisations also have user representatives and Government nominees on the Board of Directors, in addition to several key senior management positions filled by officers from Defence Services either on deputation or on permanent absorption. Also, unlike in the case of Defence public sector undertakings, the Government and, therefore, the user has no control over the prices of the product and services. Hence, there is room for fear of any unreasonable hike in price of products and services when the demand becomes critical especially during an emergency.

The traditional custodians of the Defence production viz. Defence public sector undertakings and the ordnance factories have a fear of losing their business to the private sector. The private sector and public sector are not on the same level

playing ground. For example, the public sector has several masters to whom it is accountable, viz. the Government, Parliamentary Committees, the Statutory Auditors, Vigilance Department, Central Government Auditors and so on. In addition to this, the public sector industries have several social and statutory obligations to be fulfilled with respect to recruitment of manpower, acquisition of technology, investments, procurement of materials, award of contracts and so on. With all these burdens on the public sector, it is natural that there is potential for private sector to be more competitive. Private sector also has several advantages over the public sector in their marketing philosophy and procedures. Hence, there is room for lack of motivation on the part of the current Defence production units to share technology and business with the private sector. On the positive side, it is advantageous for the public sector to partner with the private sector as all these strengths of private sector could be made use of to the benefit of both parties as well as for the customer. In this analysis, I have presented a number of doubts and fears for private sector, public sector and user. It is possible that when these issues are addressed jointly by all the three parties, they get to understand each other and with the building of necessary guarantees and good procedures to work in harmony for the common goal and to achieve greater self-reliance in Defence production, matters would be different.

An Approach

The Defence services, buy their long term, short term and urgent requirements with the approval of the MoD, either from overseas suppliers or from within the country, if production of the items is indigenously established. When the items or quantities are large and of strategic nature, licenced production of the same through Defence PSUs or Ordnance Factories is undertaken. Licenced production through private sector is rarely established. Based on long

term equipping plan of the Defence Services, in-house R and D is undertaken for design and development of equipments where capability exists either by DPSUs or by DRDO, and in some cases jointly. Productionising is done through DPSUs or Ordnance Factories. Products developed by DRDO are manufactured predominantly through the Defence PSUs and partly through private sector. It is necessary to evolve a suitable model for the private sector involvement in Defence production. Since the long term equipping plan of the Defence Services is confidential, in view of national security, it may not be practical to publish it and let industry go ahead and obtain licence for manufacturing these in the country. It is very necessary for the MoD and the DRDO and in-house R and D of the Defence public sectors to work on the feasibility of indigenous design and development of major items such as aircraft, missiles, ships, guns, tanks etc. taking into account the expertise and facilities available in the private industries and other organisations. For some more time, we may have to continue manufacture of major items in the Defence PSUs and Ordnance Factories considering the heavy investments already made and the investment required in the private sector if such items are to be manufactured by the private sector. If the items are considered for licenced production from overseas organisations, here again we have, for some time, no other option except to go through the Defence PSUs and Ordnance Factories for major equipments. The reasons are the same, regarding the investments as mentioned earlier. However, private sector can play a major role in the manufacture of sub-systems and components as well as support equipments. Here, the private sector industry could be a sub-contractor to the Defence public sector or Ordnance Factories or be a direct supplier to the Defence Services. Wherever the private sector is a direct supplier to the Defence Services, I do not recommend competition between public and private sector for the reasons already explained in the

earlier section. It is necessary to encourage co-operation between Defence public sector units and private sector rather than building competition although it is generally felt that competition is good for improving efficiency, quality and cost, among other things. But under the current circumstances, such competition will only be counter productive and it is absolutely essential to have harmonious relations between private sector and public sector who are operating under different environments. Our real competition is from the overseas supplier and our goal is to establish greater self-reliance. Co-operation between Indian private sector and overseas equipment and component manufacturers should be encouraged for mutual benefit. Licenced production, joint production and co-production between Indian private sector and overseas organisations to meet the Defence needs, should be included in this model and encouraged. It will create more job opportunities, wealth and welfare within the country. As far as overseas partnership is concerned, they will have the benefit of lower cost of production and higher profit margins and the captive market within our country because of such partnership. Such a partnership will open up global market for the Indian firm.

Offset Policy in Defence Procurement

Many countries have an offset policy linked to their Defence procurement. This policy makes it mandatory for the overseas supplier to buy from industries in the buyer's country, goods and services valued at 'X' percentage of the import. It is evident from the tender forms of these countries that it stipulates offsets varying from 20 per cent to as high as 50 per cent. Coming from the aeronautical industry, I know for sure that 'offset' is stipulated in countries like Korea, Singapore, Philippines, Japan, Canada, Australia etc, with respect to import of aircraft. Such mandatory stipulations have given a spurt in the aeronautical and defence industry in the private sector and public sector industries in these

countries. It would be desirable that such an offset policy is introduced in all our Defence procurements and give credit to the overseas suppliers against offset obligations for their purchases from both private and public sector industries.

Technology Transfer Agreements

Currently, the technology transfer agreement for production and maintenance (or for maintenance only), is negotiated and concluded after the main purchase agreement is signed. This puts the participating public sector or private sector industries from India for the licence manufacture or maintenance at a big disadvantage. Since the supplier has already got his major order, that firm could give unreasonably high licence fees and other associated costs and make the licence production or licence maintenance facilities uneconomical. The MoD and the user lose the leverage for negotiations as the commitment for procurement of the major equipment has already been concluded. Hence, it is desirable that the negotiations for the procurement of the Defence equipment and the negotiations for the technology transfer, whether it is for production or for maintenance, be carried out in parallel and the overall cost or life cycle cost is used as a criteria for selection. It is also desirable that the designated private sector industry or the public sector industry is associated fully during such negotiations.

Success of HAL in Developing Indigenous Vendors

Hindustan Aeronautics Limited has very successfully overcome some of the difficulties in involving private sector undertakings in Defence production over the last three to four years. Out-sourcing has been enhanced manifold from about Rs. 27 crores in 1997 to Rs. 230 crores in 2000. This has been possible due to considerable efforts in improving the vendor development through workshops, awareness programmes, suitable guidelines to take care of the interest of the private sector from unnecessary risks and to ensure

continuity of the order, provided the cost and quality are maintained. Also the procedure allows certain amount of development funding along with the development order, either directly or indirectly. Salient features and the guidelines followed in encouraging private sector participation as a supplier of various items is given in the Annexure.

SIATI

The Society of Indian Aerospace Technologies and Industries (SIATI) was founded in 1992 with a view to encourage private sector participation in the development and supply of materials, equipments and systems for aircraft and aerospace, primarily for HAL and ISRO and also to encourage technology tie up between HAL and ISRO, in-house R and D as well as with the DRDO and other Laboratories. SIATI has a Governing Council with key people from HAL, ISRO, Director General of Civil Aviation, DGQA, National Aeronautics Laboratory (NAL), Aeronautical Development Agency (ADA) and private sector industries. SIATI has now about 300 industry members who are supplying various items to both HAL and ISRO as well as directly to the Indian Air Force, the Navy and the Army. SIATI members are also encouraged to have interaction with overseas manufacturers and a number of interactive workshops have been organised with the support of MoD between Indian industries and European Aerospace Industries Associations. A number of SIATI members have also become exporters of their products in addition to supplying to HAL and ISRO. Over the years SIATI has organised jointly with HAL, ISRO and the Defence services a number of workshops and exhibitions on indigenisation of imported items, workshops on air worthiness, quality requirements, technologies and facilities and thus have given major impetus to indigenous development of aerospace components. New projects like Advanced Light Helicopter (ALH) and Light Combat Aircraft (LCA) have a major indigenous content. For

the satellite projects as well as the Launch Vehicle projects such as ASLV and PSLV, there is considerable participation from the private sector. The ISRO-HAL-SIATI experiments show that it is possible to motivate private sector to participate in Defence manufacture.

SODET

The Society of Defence Technologists (SODET) was established under the patronage of the Ministry of Defence Production and with the approval of the Defence Minister. Membership of SODET consists of all the Defence public sector undertakings and Ordnance Factories. The Governing Council consists of the CMDs of the respective units and members from the Ordnance Board and the heads of DGQA and Defence Standardisation Cell. The objective of SODET is to facilitate sharing of technology, expertise and facilities among the Defence production units and to plan development of newer and advanced technologies for future either through in-house R and D or in collaboration with the DRDO and other national laboratories. SODET could play a role in future in private sector's involvement in Defence manufacturing, perhaps by extending the membership to private sector industries who are involved in the Defence manufacturing and sharing of technologies and facilities as is being considered for the current members.

Conclusion

Private sector industries must play their legitimate role in enhancing self-reliance in the Defence manufacturing and associated services. Since the investment involved in the manufacture of main equipments are very high along with associated risks, and considering the facilities already established in the public sectors and ordnance factories, it is desirable to start the private sector participation at component level, systems and sub-systems level as well as for support equipments and gradually take on major assemblies. One of

the models could be that private sector becomes major sub-contractors to the Defence production units and in some cases be a direct supplier to the Defence services. Co-operation among public sector and private sector manufacturing units should be encouraged rather than building any competition. Suitable policies for providing development funds directly or indirectly by the public sector and Ordnance Board and other developing agencies to the private sector could be considered. Involvement of private sector with the public sector in-house R and D as well as DRDO and MOUs, technology tie ups for concurrent engineering and productionising of the products developed will be useful. Suitable policies for including offsets in Defence procurements and negotiation of technology transfer agreements along with procurement agreements involving the participating indigenous industry and encouraging joint ventures, co-production agreement and so on will be desirable in enhancing private sector participation in Defence manufacturing. Necessary controls and procedures should be instituted to ensure sustained supply of high quality and reliable products and services with continuous improvement in productivity, quality and costs. The aim should not be just participation of the private sector industry for the Indian Defence needs, but to open up the global market through not only their own efforts in improving quality and costs but also through certain supportive policies from the Government as mentioned earlier.

Annexure

GUIDELINES FOR INDIGENISATION AND SUB-CONTRACTING

Introduction

Sub-Contracting is a form of off-loading part of Company's work or certain activity to an outside agency in private/public sector when work load is beyond in-house capacity and increase of capacity is not justifiable due to techno-economic considerations. This includes reservation of available in-house capacity for critical and more difficult items. Sub-contracting covers machining, grinding, milling, turning, casting, fabrication and further processing like heat treatment, plating etc.*

Indigenisation is development of substitutes for imported raw materials, aeronautical systems or components by outside agencies in private or public sector having required specialisation, either as design or development contracts or development contracts to Company's design or specification justifiable techno economically or need for self reliance.

Selection of Vendors

Selection of vendors for the type of work indicated above is extremely important. To achieve the desired result, extensive market survey shall be carried out through normal commercial procedures of open advertisements/or by inviting offers from known sources in the country / abroad if so required. It shall be ensured that the vendor has adequate facilities, management systems, engineering systems, quality systems, reasonable skills, reliable track record and financial soundness and stability. These can be assessed either by obtaining documents from the probable vendors or by visiting their works if found necessary.

General Principles for Source Development

The following number of vendors may be developed for indigensation/sub-contract work depending upon the value per annum per item :

Category	Annual requirement in value per item of source	Suggested number
Indigenisation		
	Upto Rs. 20 lakhs	1
	Above Rs. 20 lakhs but less than Rs. 50 lakhs	2
	Above Rs. 50 lakhs	3
Sub-contracting		
	Upto Rs. 5 lakhs	1
	Above Rs. 5 lakhs but less than Rs. 10 lakhs	2
	Above Rs. 10 lakhs	3

Having successfully developed source or sources by normal commercial procedures, it must be ensured that orders are placed on the same source/sources without resorting to further tendering but based on rate contract or on a mutually agreed price/price escalation.

In case of items requiring two or more sources and in case of succeeding in the development of only one source in the initial attempt, efforts must continue for developing second/third source as the case may be. However, bulk order should continue to be placed on the first source developed and only trial orders on the others until the second or third source is established.

While all efforts should be made to sustain and ensure growth of the source/sources developed, further tendering for the same item should be resorted to only in case of the following :

(a) If there is a tendency for slippages in delivery or quality.

(b) Non-adherence to agreed prices

(c) Inability to meet delivery of the quantity required by customer due to capacity constraints.

DISCUSSANTS

Air Vice Marshal Samir K Sen (Retd)

During a sojourn to the Paris Air Show, one of the company representatives inquired as to why India was short on Defence production and purchase most of their requirements. This is not an infrequent expression. Defence production and Research and Development are not the prerogative of the Defence alone. It is on the contrary a very vital public affairs issue. Take the case of Massachusetts Institute of Technology, which has a Department of Engineering and Public Affairs or the Carnegie Melon University, which has a Department of Technology and Public Affairs, to name just two. It has been a matter of concern as to why despite investing a lot of money in this field we have put up a poor show in this area. The Defence Technology and Industrial Base (DTIB) is a conglomeration of Research and Development, manufacture and maintenance. Our DTIB is still marginal for the entire Defence procurement system. We have a lot of Defence production; a majority of which is licensed manufacture or a variant of it.

I retired as Director Terminal Ballistics Research Laboratory (TBRL) after working for nearly two decades in defence research and production organisations, and, prior to that, for some seventeen years in the Air Force. There is a serious problem with our Defence procurement and production. After five decades and more of independence most of our Defence procurement consists of either outright imports or licence-manufactured, imported goods.

The most important point that has been made in the paper by Major General D N Khurana is about why our Defence equipment needs are being met by import. The reason, according to him, is 'the existence of a large gap between the requirements and the ability of indigenous industry to meet them'. The author has described the nature

of this gap and the methods to bridge this gap. He has strongly advocated the enlargement of the area in which the private sector ought to involve itself, and many of the suggestions made by him are, in my opinion, entirely valid.

The second paper, by Vice Admiral Bhatia, has addressed the question whether the private sector industry can take a bigger role than heretofore, and if so, how. He has rightly mentioned that till now the private sector has mostly been given the role of a sub-contractor to Defence PSUs and OFs for effecting supply of raw materials, semi-finished products, components and sub-systems. He has also stated that it is only in the case of warship production that there has been a relatively greater success in achieving self-reliance. Our Naval decision-makers have acted differently and done a good job. It is upto us to assess the reasons why this has happened.

The highlight of the paper by Dr Krishnadas Nair is that the problems of privatisation of India's Defence industry have been analysed from a public sector, aircraft industry's point of view. He has stated that large-scale privatisation, especially in those cases where large infrastructural investments are required to be made by a manufacturer, is not practicable in India in the short term. He has then dealt with the issues of technology transfer agreements, vendor development and so on. He has also highlighted the possible roles of two, newly-formed Societies, namely the SODET and the SIATI, with which he is connected and which, in his opinion, can play major role in bringing about self-reliance through the enlargement of the role of the private sector in Defence production. I do not quite agree on this observation.

The papers presented here have some very good suggestions. However there is one basic question yet to be answered, namely, why it is that our existing system of Defence production and procurement has been a dismal failure as far as self-reliance is concerned.

It would appear from their presentations that if the recommendations regarding involvement of private sector were to be implemented by the government, there will be a quantum jump in achievement of self-reliance in Defence procurement. The fact, however, is otherwise. The basic issue is that unless the managements of Defence procurement and development-cum-production are restructured and interlinked to allow for Defence procurement to drive development-cum-production of indigenous weapons and equipment, and the setting up of integrated units, whether in the public or the private domain, for various classes of weapon and equipment, the much-needed success in attaining the required level of efficiency and self-reliance in Defence procurement and production will elude us. In short, the basic issue is not addressed. Suggestions such as those made by the authors are only cosmetic. And, despite the fact, now widely acknowledged by all industrially developed countries, that the competence of our technologists is second to none, we will continue to fall short of achieving self-reliance and will continue to resort to outright import of weapons and equipment or manufacture under licence.

And, finally, as is the case with integration of the Armed Forces Headquarters into a restructured MoD, the restructuring of higher Defence management for Defence procurement and development-cum-production is also a pre-requisite. Here, I may mention that such a restructuring will mean the replacement of a part of the present department of Defence and the corresponding elements in the Armed Forces' Headquarters, the entire set-up of the present Department of Defence Production and Supply and of a large part of the Department of Defence R and D by new, integrated and suitably-manned higher Defence management agency for overseeing both the development ie developing indigenous weapons and equipment using already-developed technologies, as opposed to the Defence Research function

which aims at developing new technologies for future applications. It must continue to be overseen by the Scientific Adviser's Department, and the manufacture of the indigenously developed weapons and equipment should be under integrated management.

There has never been an organisation or structure like the one we have, with an all-encompassing bureaucracy like the IAS with its attendant ills, in either the industrially developed countries or the newly developing or developed countries like Israel and Communist countries like China. The vested interests of the politicians, the Indian bureaucracy, and, to a considerably lesser extent, some old-fashioned top-brasses of the Armed Forces are still coming in the way of such a restructuring of higher Defence management for Defence procurement and production.

However, on an optimistic note, I believe that the emerging circumstances will soon force such a change in Defence procurement and production management structure and make it possible for us to achieve the required level of efficiency and the required degree of self-reliance.

Commodore H S Punia (Retd)

When we visited the National Chemical Laboratories at Kharakvasla, the Director there commented that they were trying to reinvent the wheel. However, it is to be noted that all the laboratories have played an important role.

At the time of Independence, India had only one engineering college at Roorkee. Development started from a scratch. Now, things have improved in India and we have technical and managerial expertise available.

Partnership with industries needs a positive approach. Consultations and discussions are a vital part of it. In terms of policies and procedures various suggestions have been made. The Navy came up with the maximum number. The

reason for that could be because they are all co-located in one ship and can exchange views. Such is not the case with the Army and the Air Force.

Post World War II, the US got the industrialists, academics, scientists and Defence officers to come together to set the pace of progress there. The industrial groups have social responsibility. The defence of India is the responsibility of everyone. As Admiral Bhatia mentioned, one must go beyond profit.

Lieutenant General S S Apte in his presentation in the First Session remarked that there were many matters that had gone wrong. He is a specialist on spare parts management. He has not been successful in effecting the Army HQ to change the procedures. It is surprising that we are still unable to streamline our procedures for improved interactions.

The primary concern of any man at the top is boundary management. He must make himself redundant to run his own factory. He must arrange matters in a way that those at the second level are able to handle things well. His job is at the 'boundary' where his company interfaces with others, be it the DRDO, the MoD or others. It is yet to be seen as to how much boundary management we can do and how much time we spend to run our own industry or organisation.

Another significant point made in this session was regarding meeting development costs. The industries are very chary about it. Certain Western countries have large orders. The Japanese have their own set up and this despite not having a large military. Their model deserves a study. It is true that we have to increase exports to achieve economy of scales. On the matter of subsidy, if India can produce and export something even if subsidised, then that item should be exported at a marginal cost in order to establish a market.

Unfortunately, we are yet to develop an industrial concern. We have the case of Enron, which spent US $64 million on education in India as part of their project. We have industrialists who can bear the expenses but they do not do it. Without a strong legal system it is difficult to tie up the industrialist. In the event of default, it takes 15 to 20 years to get the money back.

We have moved from import to indigenisation. The next step is to move to privatisation. Delays in this progress could be attributed to vested interests who prefer to purchase rather than make.

GENERAL DISCUSSIONS

Lieutenant General M R Kochhar, PVSM, AVSM (Retd)

We have studied the Defence industries of Israel and South Africa, but not so much of Japan. Their domestic requirement is less, but they are doing extremely well in the Defence industry sector because their Government encourages and ensures the availability of export opportunities for them. When our Services do not have a big enough order, the idea of helping industries to export Defence products is an issue that is bogged down in procedures today.

Major General D N Khurana, AVSM (Retd)

There are problems in the public and private sector. Self reliance in Defence production is a dynamic situation. Defence requirements are never static. And, therefore, the public sector enterprises, which were the best at one time, may not suffice over time as the environment undergoes changes. The query is, why cannot these sectors be modified to meet changing requirements? Maybe one could think in terms of privatising the public sector while maintaining control over it for the sake of self reliance.

We need to evolve a system whereby the government

may have a 50 per cent share and the private sector has the remaining share. The government can exercise control during emergencies or under certain other contingencies. This way the base of the self reliant structure would increase and be a stimulus for other private industries to look to.

Commodore H S Punia (Retd)

I agree with both comments. Public sector participation is being discussed not because the private sector is not doing the job or because of any growing constraints. It is with the increasing requirement to have everyone involved and because the money involved in the private sector is also public money. Hence they have a legitimate role to play. Instead of additional investments in the Defence field and Ordnance Factories (OF), when future requirements are there one could use the resources available in the private sector. Further, instead of making an entire product again, some of the sub assemblies could be contracted from outside thus bringing down the investments. Work could be on a broader base.

The need to make government control over public sector flexible was mentioned. There are too many restrictions at present. It is not a matter of whether the private or the public sector is better; both have efficient as well as sick units and both sectors have to be utilised optimally.

Major General D N Khurana, AVSM (Retd)

There was a question about what is the most important factor that is required for moving towards self reliance. The answer lies in making the private sector industries partners. Partnership is not just about contracts; it is a matter of mutual trust and mutual benefit. Unfortunately, this is the one factor which is glaringly absent. The attitude is one of critical thinking between industries and the Defence. In my seven long years of interaction with industries in India, one factor was quite visible – the industries were keen to share Defence

production not just for profits but because they felt they owed that much to the nation. The key word is *partnership.*

Air Marshal R C Bajpai PVSM, AVSM (Retd)

In your opinion, what is the most important factor necessary for self reliance in Defence production and, secondly, what is the necessary prerequisite for export of Defence items?

Air Vice Marshal Samir K Sen (Retd)

It will depend on the restructuring of the Defence procurement organisation and absence of any role for the bureaucracy in it. There is a need to integrate the DRDO labs with the corresponding group of OFs. There are at present four OFs involved in armament manufacture which could be integrated with three R and D labs whose basic thrust is the same. Then there is a need to make it a public sector organisation. This is the case in France.

It should be appreciated that unless production is efficient, export is difficult. Our productions are based on licence system and that is extremely inefficient.

Wing Commander Gupta

Research organisations like the DRDO are not really inclined to share their research results with the private sector. How does one make this happen?

Secondly, the private sector finds it difficult to invest money in research unless the cost of research is shared. How can one overcome this malaise? Could the private sector avail some advance when the purchase orders are given?

Dr C G Krishnadas Nair

The DRDO is willing to share research results. They welcome the participation of private sector or Defence PSUs right from the start.

Regarding funding for research, the public sector like the private sector ought to be funded for research provided there are some guarantees as far as results are concerned. The same applies where advances are involved. There has to be an assurance of quick delivery of item requested.

Major General Y K Gera (Retd)

It is clear that funding is one of the major road blocks with the private sector as far as Defence development and production is concerned. Instead of thinking in terms of money; why not some concessions be given? If a private sector industry were to produce something for the Defence, it could be treated as export, and all the concessions that go with exports should be given to them. Import of materials should be allowed as that may be required by them to manufacture a particular product. The customs on such imports should be subsidised. The excise duties on the product should be subsidised too, within the country. The Government as such does not have the provisions to make any advance payments for purchases. Change in procedures in this country is not an easy task.

Relegating private sector to be the sub vendors to a Defence public sector undertaking will not keep their interest surviving for long. Now that Defence production is being opened up for the civil sector too, it may be necessary to leave it open to the private sector to produce whatever is possible in their capacity and within the technological ambit.

Air Marshal Vinod Patney SYSM, PVSM, AVSM, VrC (Retd)

There is no embargo on private sector's participation. The point is that if the private sector is asked to manufacture aircraft, there is nobody to come forward.

Colonel Mahinder Kumar

If the demand was for the supply of tanks for instance,

that industry which showed keenness to provide us with it would in all probability go for a joint venture with a foreign company.

Air Marshal Vinod Patney SYSM, PVSM, AVSM, VrC (Retd)

The point is that we do not have to tell someone to produce a tank. If the private sector wishes to be involved, it should be self-invited. Protectionism has been the bane of our country.

Colonel Mukherji

Based on the GSQR given by the US Army, two firms were appointed in America in 1967, to develop two models. After their completion the first prototype came out in 1982. The point here is to indicate the time it has taken to produce the XM1*Abrams*.

Air Marshal Vinod Patney SYSM, PVSM, AVSM, VrC (Retd)

The two concerns had a regular industry going and were used to making tanks. Further, there were no other firms from whom the US Army was to get its tanks. In our case too, we can state roughly what our demands are. The question of making them thereafter is never easy.

Lieutenant General M R Kochhar, PVSM, AVSM (Retd)

It is a problem everywhere to make an impression and change things. If the Government stands accused of being a bureaucracy, the Army is no less. It is not that things cannot be done; it is just that it is difficult to be done.

NEED FOR JOINT COLLABORATION AND DEFENCE EXPORTS TO MAKE DEFENCE INDUSTRY VIABLE AND SELF RELIANT

THIRD SESSION

Chairman : **Vice Adm PJ Jacob, PVSM, AVSM, VSM (Retd)**

First Paper : **Air Mshl RC Bajpai, PVSM, AVSM (Retd)**

Second Paper : **Vice Adm Raman Puri, PVSM, VSM**
Dy Chief of Naval Staff, Naval HQ

Third Paper : **Lt Gen R I S Kahlon, PVSM, UYSM, AVSM (Retd)**

Discussants : **Lt Gen CK Kapur, PVSM, AVSM (Retd)**
Brig Subhash Kapila (Retd)

MAJOR GENERAL Y K GERA (RETD)
DEPUTY DIRECTOR AND EDITOR USI

I welcome you all to this third session of the annual USI Seminar 2001. During the second session, it was commented that those attending the seminar were already well versed with the problems of inadequacies of the system and perhaps an attempt was being made to educate those already educated in this subject ! It perhaps has been assumed that this entire exercise could turn out to be a waste of time and effort. On the contrary it is not so. The published version of these deliberations will go to the MoD, MHA, MEA and it will also be ensured that a copy goes to the Department of Defence Production. Many of the USI members also happen to be members of the National Security Advisory Board. They are active participants at various forums and the views expressed here get highlighted there. Many USI members write in the newspapers too and there too these views get reflected. There are USI members in various government task forces and committees. All this thus gets reflected at different levels and forums.

This session is being chaired by Vice Admiral P J Jacob, PVSM, AVSM, VSM (Retd), former Vice Chief of the Naval Staff and a distinguished member of the USI. He has also been the President of the USI Council.

VICE ADMIRAL P J JACOB, PVSM, AVSM, VSM (RETD)

CHAIRMAN

It is indeed befitting the USI to have selected "Self Reliance in Defence Production" as the topic for the 2001 USI annual seminar. Despite a few cases of remarkable successes the general picture is far from rosy. This inspite of our having set ourselves the target of achieving self reliance in meeting our military requirements soon after independence. Surely, after five decades of efforts, a mid course correction is urgently required.

In the Second Session, an honest appraisal of our achievements and inadequacies, and the reasons for less than reasonable performance was carried out. The involvement of the private sector and the aspect of import of technology to improve our performance were also discussed. Now, we shall be looking into the aspect of "Joint Collaboration and Defence Exports to Make Indian Defence Industry Viable and Self Reliant".

Despite a significant rise in the stock of Defence industry shares worldwide, post 11 September 2001, the international Defence industry continues to be in a state of turmoil as evinced by the scramble for large scale mergers and consolidations of such companies. If anything, recent events may accelerate the changes already under way.

The Indian Defence industry on the other side, has been protected from this turbulence; they continue thus to be isolated from the reality of the market. In this protected environment, the PSUs were sacred and Defence PSUs occupied the inner sanctum. Though the proposal to privatise some of them is there, not much headway has been made in this regard. Any significant move to vitalise the Defence industry, whether by joint collaboration, private participation or exports must come essentially from the Government. This

is indeed a tall order. We are yet to initiate a response to the sizeable changes technology and pressures of the market have brought to bear on the way the Defence industry worldwide does business.

Competing budgets and lack of government support have forced the companies everywhere to consolidate and look elsewhere for markets. India cannot afford to remain isolated from this for long. Even the Indian Defence industries will have to consolidate through joint collaboration private industry participation, or otherwise,and seek alternate markets in order to survive. The problem arises when other companies of the same or another country eye the same market. The strategy to adopt would be to survive rather than hope to stay ahead.

In April 1999, the MoD had instituted a Task Force on commercial processes to evolve methods to make participation by private industry viable in the Defence sector. The Task Force recommended a number of initiatives which included transparency in the various processes associated with Defence procurement as also concessional tax regimes. These are yet to be implemented though a start seems to have been made with the creation of the Defence Procurement Board and the Defence R and D Board.

I am also aware of a move to formulate the Defence Exports strategy in the year 2000. Whatever be its final shape, the strategy has to be clear, with commercially feasible guidelines on the following factors:

(a) National policy on export of Defence equipment, etc.

(b) Export marketing organisation.

(c) Involvement of private sector/agents.

(d) Policy on offsets.

(e) Transfer of technology.

(f) Pricing and financial support.

(g) Defence export as an instrument of foreign policy.

(h) Observance of UN and other arms control export regimes.

These are complex issues that require examination by the Ministry of Defence, Department of Defence Production and Supplies, Ministry of External Affairs, Revenue etc. These issues need to be tackled with some urgency if we are to make some progress.

I am reminded of a brochure brought out by M/S Thales (pronounced as Thay-lees), formerly the Thomson CSF of France, after their consolidation in 2000. They named their new conglomerate after the Sixth Century BC philosopher and scientist, Thales of Miletus, to give the conglomerate a universal appeal. The brochure described in glowing terms, Thales' claim to fame as one of the seven wise men of ancient Greece. What had been overlooked was that Thales was probably the only philosopher with an acute business sense. He made good profit by some astute marketing of Olive Oil. I presume that Thomson CSF was well aware of Thales' reputation when they chose his name for their conglomerate. It is not just in business and industry, philosophers are aware that profitability is the key to survival in Market matters.

In this session, we have three very eminent speakers. Air Marshal RC Bajpai, PVSM, AVSM retired as the AOC-in-C, Maintenance Command in 1996 after 36 years of Service. He is technically highly qualified being an M Tech with expertise in Electronic Warfare. He has been associated with the development of India's first phased array radars, AWACS programme. With his close association with the cutting edge development projects we will have an interesting and informative exposé from him. Vice Admiral Raman Puri,

AVSM, VSM, is a missile and gunnery specialist. He has taken active interest in matters of science and technology throughout his career. As a member of the Naval Research Board, he has been involved in the indigenisation programmes of the Navy. He has written extensively on indigenous radar and missile technology. A graduate of the Command and Staff College of the former USSR and an alumnus of the NDC, he has had a number of operational and staff appointments, and is presently the Deputy Chief of the Naval Staff at Naval HQ. In this capacity he is responsible for providing operational inputs so very essential for the procurement process. Lieutenant General RIS Kahlon, PVSM, UYSM, AVSM retired from the Army in 1997, after having served with distinction in a number of field and staff appointments, which included command of a division and chief of staff of a strike corps. His spell as Town Commander of Jaffna in Sri Lanka during IPKF operations earned him UYSM. He is a graduate from the Command and General Staff College at Fort Leavenworth USA. He is also an alumnus of the NDC. With his operational background and a long tenure as MGO at the Army HQ, where these issues were directly addressed by him, we are in for a very forthright presentation.

Our discussants are Lieutenant General CK Kapur, PVSM, AVSM and Brigadier Subhash Kapila. Both have had distinguished service in the Army and are actively involved in Defence studies and analysis.

THIRD SESSION : FIRST PAPER

AIR MARSHAL R C BAJPAI, PVSM, AVSM (RETD)

Economic and military strengths are two basic instruments of foreign policy. In the pursuit of these objectives, independent India decided to achieve self reliance in the field of military requirements. Accordingly in the year 1956 in its industrial policy resolution, defence industry was declared as a "core sector". A chain of 39 ordnance factories and eight defence public sector units (PSUs) have been engaged in meeting the Defence requirements. In order to further the indigenous capability, a Defence Research and Development Organisation (DRDO) was established in the year 1958. Today it has 49 laboratories and establishments with a manpower of more than 30,000 personnel including about 6000 scientists and engineers and an annual budget of about Rs 3000 crore. It would thus be seen that initially private sector was consciously kept out of the Defence industry.

India has one of the largest Defence industrial bases albeit in the public sector. As for the ordnance factories, these have been primarily engaged in the production of clothing items, small arms and ammunitions, parachutes etc. Defence PSUs like Hindustan Aeronautics Limited and Bharat Electronics Limited have been producing aircraft, radar, communication equipment and some other equipment mainly under licence or under collaboration from foreign vendors. Bulk of the Services requirements were met through imports mainly from Russia. The DRDO has been engaged in indigenous development of technology and has undertaken some very prestigious and sensitive projects like AWACS, missiles, Light Combat Aircraft (LCA), helicopters and the MBT (Main Battle Tanks), to name a few. With the exception of missile programme, which has made substantial progress, other projects have performed very poorly in meeting the qualitative requirements. In fact the all important AWACS

programme, which was a force multiplier, died a premature death. There have been excessive time delays and cost over-runs. Any number of reasons may be assigned for the failure but the fact remains that it has from time to time affected the operational preparedness of the Defence forces. Before any equipment can be imported, clearance from the DRDO is mandatory. If the DRDO does not clear the equipment for import and undertakes it for indigenous development, generally the Services find it difficult to meet their requirements in time. The prime reason for such failure has been the lack of honest appraisal of our capabilities and over eagerness to undertake any project as also the absence of accountability.

In the initial years after independence, the spares for the foreign equipment were imported since it was the responsibility of the original equipment manufacturer to provide the product support and also these were not available indigenously. In early 60's the serviceability of the imported equipment started getting effected due to non- availability of critical spares. Thus action was initiated to substitute the imported spares by indigenous ones. Two departments namely Directorate General of Quality Assurance (DGQA) and Directorate General of Aeronautical Quality Assurance (DGAQA) were created to undertake the indigenisation of Defence stores including its quality control. Their activity was mainly confined to act as authority holding sealed publications and encourage private entrepreneurs to undertake the indigenisation of small items like passive components and small modules.

In the year 1974, an idea was mooted to form the national radar council to undertake the indigenisation of radar spares and components. The response of the private sector was dismal for two reasons – lack of economy of scales and the capital intensive feature of the Defence industry. It was decided to consolidate the requirements of all the three

Services to make indigenisation cost effective but this did not succeed. Defence Services continued to depend on the import of their requirements individually. It may be mentioned here that as against a domestic production of Defence equipment worth about Rs 8,112 crores in 1996-97, imports of weapon systems during the same year aggregated to approximately Rs 6,000 crores. Incidentally India is one of the biggest arms producer in third world countries. Export during three years from 1997-2000 has been at an average of Rs 135 crores per year.

Participation of Private Industries in Defence Production

Despite the fact that the DRDO has made significant progress in some areas, it has not associated private industries in the development of major equipment in any significant manner - an exception being the missile programme, where it has involved a large number of private industries. Even the public sector units have not made any significant progress in this regard. While earlier the government did not want the private sector to enter into Defence areas primarily for reasons of security, these industries themselves were reluctant to participate in defence production for the following reasons.

(a) Lack of economy of scales.

(b) Non-availability of technical know-how.

(c) Delays in finalising the requirements and placement orders by defence departments.

(d) Frequent change of specifications by the user.

(e) Difficulty in meeting the stringent requirements of Services and maintaining quality control.

(f) Lack of coordination between DRDO, PSUs and private sector.

(g) The presence of bureaucracy and red-tapism in the government.

During the last two decades the Indian private sector has made significant progress and matured in the industrial and technological fields particularly in the field of information technology. Modern machines and facilities have been installed by the private entrepreneurs for the civil production but can also be effectively used for defence production. These industries are trying to diversify their business. The government, finding that the PSUs were faltering and were running into losses and were not able to meet the Defence requirements adequately, decided to liberalise its policies to open up the Defence industry to the private sector. Opening up the Defence sector to the private sector would not result in privatisation of Ordnance Factories or Defence PSUs, nor would it imply corporatisation of ordnance factories. At the opening up of the defence sector this year a press note stated "the defence industry sector opened up to 100% for Indian private sector participation with FDI permissible upto 26% both subject to licencing." It implies that the Defence industry which was hitherto reserved for the public sector could also be set up by a private entrepreneur who could for the purpose set up a company with entire shareholding (i.e. 100 per cent) privately held. In such a privately held company, there is a possibility of having FDI upto a maximum of 26 per cent of the shares. Licensing in all cases is compulsory. Thus the intention of the policy is to obtain more private sector involvement in an important area. It is not as if 100 per cent of Defence units are up for sale to the private sector. The public sector in Defence could continue to grow and in the first instance would be instrumental in helping and mustering the private sector by off-loading requirements. Extension of disinvestment policy of public sectors to include Defence PSUs in the long run can not, however, be ruled out.

Attitudinal and procedural changes would be necessary to promote joint production with private industries. First of all the Services would have to be clear about the specifications

of their equipment. Frequent changes cause cost and time over-runs. While it may be desirable from standardisation point of view to have one type of equipment to meet variety of requirements both at high altitude and in deserts it may be necessary from the economic point of view to split the requirement into two different sets. A modular approach wherever possible should be adopted so that updates could be easily incorporated. It would also be necessary to keep in mind the environment in which the equipment is required to operate and not just copy down the specifications laid down by foreign vendors.

There is a need for much closer interaction between the user and the designer or manufacturer at all times i.e. during the planning, prototype development, evaluation and production phases. This will immensely help in cutting down the delays in execution of the project by all agencies particularly by the production agencies. The government agencies responsible for ensuring the quality have to be knowledgeable, practical and fully involved in the project. They need to associate themselves in finding the solution rather than finding the fault alone and rejecting the equipment. All this can be achieved only if there is a will to use indigenous technology and equipment and take pride in being self reliant.

Defence industry being capital intensive there is a need to pool the existing resources both in public and private sector. Also, there is a need to pool the requirement of all Services to achieve the economies of scale. It is common knowledge that an item used on more than one type of aircraft is held separately for each type of aircraft. If this item is not available for the particular type of aircraft that aircraft will remain unserviceable though the item might be held on another type of aircraft inventory. To coordinate the requirement of more than one Service, therefore, is going to be a major task and a difficult one at that. Considering the advantages, which

will accrue from this exercise, it is worth following this approach.

Component industry needs to be vitalised and strengthened. Integrated circuits (IC) industry as also other industries are required to gear up to produce the MIL grade components. If the indigenous design is based on foreign components, in the event of a ban by the provider country on the export of that item (like the one after Indian nuclear tests at Pokhran in 1998); it will render the entire effort a waste. The research and expertise available with the educational institutions needs to be harnessed and coordinated.

Foreign Collaboration

In addition to Indian industries there is a need to involve foreign industries in Defence production. It could be licensed production or some other kind of partnership. This has to be in selected areas with reputed and proven companies. In the year 1992, certain European countries had proposed a joint venture for update of MiG 21 aircraft. They wanted to develop the modification using our expertise in certain areas and thereafter export the equipment and provide services to other countries on a profit sharing basis. They had also assured that our requirement not only for this aircraft but even other types of aircraft using this equipment would be fully met. No action seems to have been taken on the report submitted to various concerned authorities. After much delay the updation of MiG 21 is now in progress with some other countries.

Organisational Restructuring

There is a need for organisational restructuring. This is so because the time taken to clear a project or product is enormous. By the time it is cleared, in few cases, it may not even be required by the user. It is, therefore, proposed that a single organisation be formed to undertake indigenisation

which should include representatives from all concerned departments like Service Headquarters, MoD, Finance, Inspection agencies, R and D etc. The entire exercise needs to be undertaken under the overall control of a retired or serving senior Defence officer experienced in this field. He will also work in close conjunction with the Services to work out their future requirements. The forward planning and projections can best be understood by the men in uniform. The DRDO and other organisations need to accomplish the tasks assigned to them by this organisation. It would also help in the reduction of manpower in other organisations.

Export of Defence Equipment

For a long time the Government of India did not enter into export of Defence equipment for the following reasons :

(a) Moral considerations.

(b) Lack of proper leadership, vision and direction.

(c) Lack of aggressive marketing.

(d) Lack of competitiveness due to faulty taxation policies.

Since independence, India has discouraged or played down arms export on moral grounds. As a matter of principle and policy it did not want to produce and proliferate the equipment for the destruction of mankind except for self defence requirements. Thus India's annual value of Defence export upto 1987-88 has been very insignificant. Whatever Defence exports were made till then were based on individual and ad-hoc efforts of the arms producing agencies in the public or private sector.

In order to meet the growing needs of modernisation of Defence equipment and provide for necessary foreign exchange it was officially decided by the government to resort

to export of Defence equipment. Exports have since moved to Rs 120.84 crores till October 2000 against the target of Rs 205.22 crores for the year 2000-2001 from a figure of Rs 45.37 crores in 1988-89. Of late, the government has liberalised its industrial policy and allowed the private sector to participate in Defence production. It has also allowed foreign participation. If this plan is executed efficiently it will accrue the following benefits :-

(a) India's Defence requirement will be indigenously met and the country will become self sustaining in this regard.

(b) India's foreign exchange requirements will be met through surplus production and its export.

(c) R and D skills will be sharpened.

(d) R and D expenses including attendant infrastructure expenses will be shared.

(e) Excess revenue so earned can be gainfully utilised for developing civil infrastructure.

(f) It will generate goodwill amongst importers.

Strategy for Joint Collaboration and Export

Joint production and export of Defence equipment is a function of economic and technological considerations as well as foreign policy imperatives. India is well suited for export of Defence equipment because it has :-

(a) Highly intelligent and trained technical manpower.

(b) It has cheap labour.

(c) It has adequate spare capacity and infrastructure.

(d) It has a strong R and D base.

A question may be asked as to why India has failed to capitalise in this sector when countries like China and other

third world countries have done far better. China has grown to be one of the biggest exporter of arms. It has exported arms to almost all the countries of the South Asian region except India and has gained their sympathies and support. India has lacked vision, courage and, most important of all, right leadership and determination. It is extremely essential that India take note of the following aspects necessary for joint ventures and export.

Organisation. We have multiple organisations to look after Defence exports like we have in many other sectors. This makes coordination very difficult. There is an urgent need to have a single organisation to formulate the export policies for Defence products. It will select the agencies to participate in the production, assess their capacity and capability, check the quality control of items both for domestic consumption as well as export, provide monetary and technical assistance, and clear the collaborative and licensed production at a single window. The organisation needs to be headed by a person with clear understanding of the subject, right motivation, and with unquestionable integrity. It should be represented by all departments concerned with the exports of Defence equipment so that the exporter does not have to run from pillar to post but gets a single window clearance.

Export Policy and Incentives. Export policy has to be clearly defined. It must be borne in mind that the export has to be competitive particularly at a time when countries like CIS and China are exporting their products at very low costs, almost at throw-away prices. The list of items and countries cleared for export needs to be adequately and clearly communicated to all concerned. The competition is going to be very tough and India needs to develop a long term policy for export of its Defence equipment.

R and D Support. India has a big defence R and D base with more than 30,000 personnel, including scientists and

engineers, and an outlay of more than Rs 3000 crores a year. Its performance has not been commensurate with the resources available. In the name of competence building, multiple agencies work on a project. This kind of multiplicity is to be avoided. Cost and time over-runs can be avoided provided the projects are closely monitored and corrective actions taken in time. After identification of the items for export, Defence R and D needs to collaborate with reputed institutions and private industries. Import of technology needs to be a one time clearance for any item. Repetitive imports must be avoided. PSUs should develop better in-house R and D centres. Generally the subsidies should be discouraged. A more pragmatic approach for indigenisation and export needs to be adopted. One should not venture into indigenising all elements of an item and land up with cost and time over-runs. A modular approach should be encouraged.

Aggressive Marketing. Marketing strategy needs a lot of attention. It has to be very carefully worked out and pursued vigorously. Target countries and areas of activity must be identified clearly. Sometime ago, when a project was received by HAL (Hindustan Aeronautics Limited) for servicing of an aircraft from a foreign country, it could not be executed because one of the Services did not provide the base facilities. While we must give priority to our domestic requirements we should not let such opportunities slip away either, especially when we have spare capacity. We should be open to opportunities for collaboration with the foreign companies in the service sector.

Service Sector. India has a very strong servicing base for aircraft radar and communication equipment. We have highly trained manpower readily available. The potential available with the retired manpower could also be effectively exploited. India has a large inventory of Russian equipment and has expertise in maintenance and modification of the aircraft and associated equipment. It has over the years

acquired the capability of integrating any weapon on the aircraft. It has also developed indigenously servicing technology of its fleet. The country, therefore, needs to seriously consider providing for the servicing of the equipment of target friendly countries rather than body shopping.

Conclusion

Despite its enormous technical trained manpower, infrastructure and production capabilities, India has failed to effectively meet its domestic requirement of Defence equipment as well as capitalise on export while China leads on these fronts. Instead of exporting trained technical manpower, India needs to seriously consider and implement the export of equipment, services and technology.

It is, therefore, recommended that India set up a proper organisation with capable and competent personnel, prepare comprehensive guidelines, simplify policies and procedures, take up aggressive marketing for the export of Defence equipment and attain self reliance. The concept of accountability needs to be included. As of now, neither the PSU nor the DRDO is held accountable for its failures and time and cost over-runs.

THIRD SESSION : SECOND PAPER

VICE ADMIRAL RAMAN PURI, PVSM, VSM

The decreasing Defence budgets, rising system costs and host of technology denial regimes operating against us, require us to consider new ways of meeting our future Defence requirements.

In the most basic sense, we have to deal with and adjust to the world outside our frontiers in 170 assorted sovereign nation-states, each in control of a certain amount of the earth's territory. These 170 nations, being sovereign, are able to reach decisions on the use of armed forces under their government's control.

This "System" of states is characterised by decentralisation. Authority and control are fragmented. Although the world today may be filled with elaborate and sophisticated devices of every kind – computers, satellites, robots, space shuttle, and " smart" weapons – its most basic political and economic arrangement remains as primitive and simplistic as in the days of the cavemen. It is decentralised anarchy, and in this environment **one's sure ally is ONESELF.** The events of 11 September 2001 have brought into focus another dimension to this anarchy, and that is of groups and states highly motivated by perverse interpretation of ideology and capable of upstaging all that civil society has stood for through the ages.

THE IMPERATIVES OF SELF RELIANCE

This understanding of the nature of the world governance leads us to a roadmap for developing our Defence capabilities. If India is to build the required Defence capability foreseeable up to 2015 - 2020, then it will call for appropriate provisioning of Defence forces of approximately twice the present capability with new weapon systems, surveillance and EW

capabilities in all four dimensions, viz; under the Surface, on the Surface, over the Surface and in Space. But doing so by import will present insurmountable difficulties; for what is developed abroad will not suit our new requirements; what is suitable will be denied; what is not denied will be unaffordable. This is the triple trap that we find ourselves in.

The systems of technology denial now practiced by the technologically advanced countries seek to perpetuate their geo-strategic dominance by locking their technology into closed cartels. These multilateral cartels act in concert to operate a triple-cordon around their technologies. The first cordon denies their export; when not denied, the second cordon renders these technologies undiffusable by restriction on their end-use by a specified end-user; when not so restricted, the third cordon of IPR (Intellectual Property Rights) - binding renders them un-replicable, even if affordable.

To lower the costs of technology-dominance to their countries of origin, the upper Varna military systems are increasingly designed to use advanced civil technologies. Those civil technologies thus become 'dual-use' and subject to technology denial regimes; foreign availability of such competitive engineering technologies across the full range of civilian industrial sectors thus contracts. If at all exported to the lower Varnas, such contemporary dual-use foreign engineering technology is end-user and end-use restricted. In-country diffusion and domestic development of 'next generation' technology based on initial import is thus thwarted. Such binding is also made more severe by IPR-binding. It is thus ensured that the exported technology becomes undiffusable across domestic industrial sectors.

When not so restricted, IPR-binding raises the price of contemporary foreign engineering technology to make it

unaffordable for purchase. Indeed, even when not IPR-bound, foreign engineering technologies are now becoming unaffordable (As against the US Dollar the rupee value has been on the decline) in their use in foreign-investment based infrastructure (e.g. Dabhol).

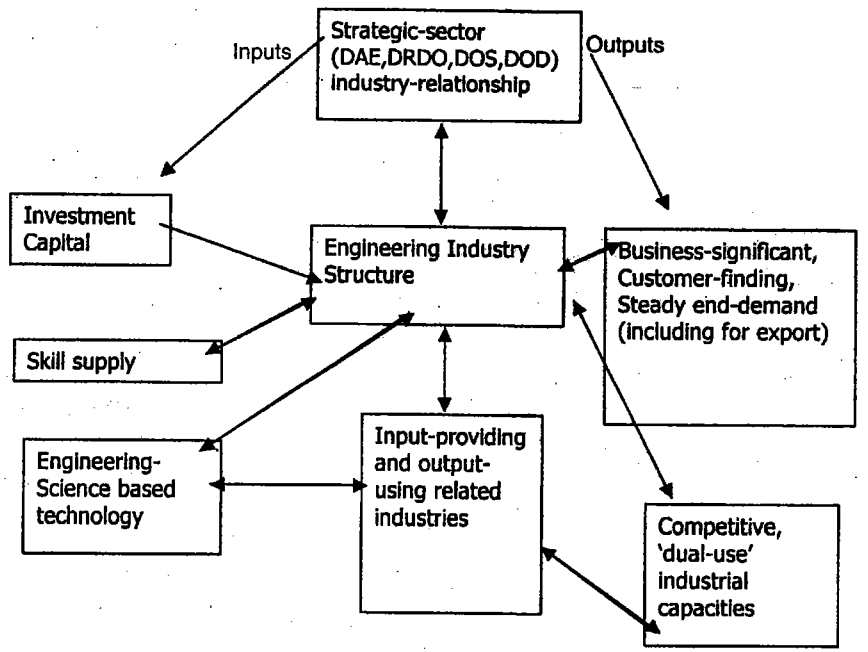
The indigenous route is an imperative for all high technology requirements of the country. To meet this vision, enhanced R and D is no doubt indispensable for both maintaining key capabilities as well as safeguarding the future Defence needs. Basic research and development has to be carried out on application of science and technology to advise in areas of interest to our Defence forces. Further, since the diversity and complexity of maritime roles will increase across the conflict continuum; R and D expertise will be required in a broad science and technology spectrum.

In addition, there is a requirement of conversion of our generated application knowledge base into processes and systems to support our missions. We can well visualise the enormity of the tasks since all this has to be undertaken in an environment of technology control regimes operating at one end and the general trend of reducing Defence budgets and high system costs at the other end.

NECESSARY RESPONSES

To overcome the debilities of the triple-cordon will require a renewed emphasis on manufacturing technology. Contrary to motivated misguidance, securing our industrial future – and, therefore, our security – cannot be based merely on services (42 per cent of GDP), such as software. Competitive survival will require that in each engineering sub-sector (e.g., machine tools, power equipment, transport) innovation will need to be stimulated by the State providing money to industry for collaborative industry. The Science

and Technology agency development of full-scale 'demonstrator technologies' and saleable prototypes. Some successful examples of such collaborative innovation already exist. These examples need to be extensively multiplied. We must also recognise that in engineering, the linear lab-to-industry 'technology transfer' model is obsolete; and that, innovation has to be stimulated in 'dual-use engineering' through a matrix architecture of the following type:



Engineering-innovation support schemes have to be tailored to suit the above matrix architecture. TIFAC's Home Grown Technology schemes seek to do just that but is coming up against our weak engineering-science base. Where we can find foreign collaborators prepared to share in such know-how development, we may welcome such collaboration, but such collaboration is difficult to come by, especially in high-tech areas.

Therefore, to avoid the "Triple Trap". The acquisition process in my opinion will have to rely on :-

(a) **Harnessing dual use technologies** all the way from basic research to accelerated concept technology development and productionising ship systems and processes to meet our mission needs.

(b) **Utilising our strengths in high power computing** and reversing the trends of manpower development distortions.

(c) **Identifying the vast national security and economic security intersection**; and the impact of technology on future Defence industry.

Dual Use Technology Strategy

As Defence budgets decrease, dual-use technology strategy represents a new way of developing military capabilities at affordable cost especially in the fields of information technology, space based surveillance and communication systems and advanced material, manufacturing and simulation and modeling. By harnessing commercial technology and capabilities, three compatible objectives can be attained :-

(a) Shortened period for weapon system development and accelerated pace at which technological improvements are incorporated into new military systems. This goal can be accomplished by introducing continuous stream of updated commercial technology during development, production and deployment phases.

(b) Reduce procurement costs of "leading-edge" technologies. Commercial components, technologies and subsystems can, in many instances, be incorporated into military systems to meet the functional requirements at

lower cost than technology that is developed uniquely from scratch for a military customer.

(c) Permit us to maintain our ability to respond to national security contingencies. Close integration with the national industrial base is imperative if the nation is to be equipped to accelerate its industrial capabilities quickly to meet the military demands.

Our ability to achieve these goals will require modifying our development and acquisition process to employ commercial business practices in R and D as well as manufacturing. We cannot design a weapon system and then expect to find commercial components with which to build it. Future weapon systems need to be consciously designed to use state-of-the-art commercial components and subsystems, and to be built in facilities with integrated military and commercial production lines. Acquisition reform is the foundation for this vision and will require operational changes to the following three pillars of dual use technology strategy requirements:-

(a) **Investment in Research and Development in Dual Use Technologies.** Basic research is dual by nature. Although it is difficult to predict the ultimate military or commercial application of basic research, the entire research programme may ultimately lead to dual use applications. We have a tremendous competitive edge here – the space and Integrated Guided Missiles Development Programme (IGMDP) clearly demonstrate that our R and D costs and production of systems through indigenously developed technology could be 1/3rd to 1/10th of those of the advanced countries. A crucial element in these developments was that the basic research effort was funded by Aeronautical Research and Development Board over the last 25 years or so. We need such focused effort in other spheres as well.

(b) **Integration of Military and Commercial Production.** The cost advantage to the Armed Forces of such integration is self evident. As a matter of fact, successful commercialisation of defence technologies will be a pre-requisite, in future, to ensure that the technology would remain accessible and affordable for military use. However, to realise this, the DRDO, PSUs and ordnance factories would need to consciously strengthen those segments of the economic infrastructure on which the Armed Forces depend. Take for example the USA, where the DoD was originally the customer for in excess of roughly 50 per cent of the semi conductor market. Today its market share is down to a few percentage points and is dropping. However, the DoD initiated and has throughout this time invested in semi conductor technologies and helped develop the industry. Now they reap cost benefits from the strong commercial sector.

(c) **Insertion of Commercial Capabilities into Military Systems.** Our acquisition reform effort should bring about simplified commercial style procurement system that gives priority to acquiring commercial products and processes and wherever possible eliminate unique contracting, technical and accounting requirements that form a barrier to greater military–commercial integration.

Following on others' experiences we need to use commercial specifications and standards instead of unique military specifications and standards, unless no practical alternates exist to meet our requirements. This would be a reversal of our practice, which requires explicit approval to deviate from approved military specifications. In short, we have to insert the best available commercial materials, components, processes, practices, products and technologies

into military systems wherever possible. This serves two objectives. Firstly, the use of commercial industry standards and upgrades will shorten duration of development and accelerate the pace at which improvements are incorporated into new military systems in critical areas – commercial computers and electronic segment products are upgraded every three to four years or so. By contrast we take much longer to upgrade systems by which time key components and technologies are no longer available. Secondly, this will be realised by us as well. To fully benefit from commercial capabilities we must strive to have sub systems 'designed for dual use', where certain systems cannot make significant use of commercial materials and components and manufacturing facilities. Much has been said and written about COTS, but a common policy which is understood across the board by the R and D establishments, industry, the users and, what is most important, the inspectors is wanting.

NATIONAL SECURITY AND ECONOMIC SECURITY INTERSECTION

A high capability level, if not the leadership, in most of the Defence related critical technologies is required to ensure national security. For instance, advanced materials and material processes enable building of both stealth ships and aircraft engines. Likewise micro-electronics packaging and software enable a competitive advantage in information processing. National security relies on industry that leads in such technology areas.

Furthermore, global competition is driving the advanced civilian technologies being developed and used by the industrial economic powers. These technologies are also necessary for our civilian industry to become globally competitive. But such advanced civilian technologies are being

denied to us on the grounds that they are " dual use". By inverse of the same logic, the inevitable efforts at genuine self-reliance in Defence guided by in-depth knowledge based development of the relevant technologies and design tools will enable Indian civilian industry to be provided with "no-strings-attached" state-of-the-art technologies, from indigenous sources; for which the industry needs to be both globally competitive and economically self-reliant. Therefore, our investment in the Defence-related scientific and knowledge base is also an investment in the development of globally competitive civilian technologies that are and will increasingly be not available to Indian industry from any foreign source. Without aiming for a globally competitive civil industry it would be difficult to have a self reliant defence capability and I do not see scope for much help from foreign sources.

AN ANALYSIS OF DEFENCE INDUSTRY CAPABILITIES

Having outlined issues of dual use technology and the economic security-national security intersection, it would now be prudent to analyse our defence industry infrastructure, both public and private.

Despite growing discontent within India over its industries, their potential remains great. With our increasingly strong computer and engineering capabilities, in the public and private sectors, India has exceptional potential. Whether or not we can take advantage of these opportunities, however, will depend on the nation's willingness to reorganise much of its existing Defence infrastructure and its ability to organise 'New Research and Development' and play by new rules and take serious steps to halt the distortions in manpower development and retention in Indian enterprise involved in research, development, production, testing and evaluation in both the public and private sectors. This aspect can be gauged

against the yardsticks stated by taking into cognissance the following important trends:-

(a) In all fields, the most sophisticated technologies are less likely to see mass production. As research and development costs have risen – not just in Defence, but in industries as diverse as electricity generation, chemicals, and steel fabrication – unique items are assembled for each customer.

(b) R and D costs often represent more than almost 50 per cent of the cost of high tech products. Indian industry to be globally competitive cannot afford this on the basis of borrowed technology. Besides, the various technology denial regimes make it difficult to get the high-end technology in civil and military sectors. The targeting of Indian public and private sector firms should make this quite clear to the US.

The key weapons of the future are more likely to be advanced and relatively unique systems that enable traditional arms to function with vastly increased effectiveness. They are more likely to be instruments of command and control and not immediate agents of destruction themselves. Further, instead of mass production, the most decisive weapons of the future will tend to be virtual prototype built in small quantities due to their cost and complexity. It seems, therefore, that instead of mass production, the most critical areas of Defence production will be dominated by prototype development alone. Technological innovation, which was previously the basis of change, will become the end of change in itself. The old premise that R and D investment will be amortised through later sales is ceasing to be valid. Our industry in general and Defence industry in particular are all premised for mass production, with technology required in both civilian and military sectors largely bought out with little scope for further development

and to some extent from the DRDO as in the case of some Defence industries that can be upgraded. However, what is required is a much greater effort at development of products based on innovation and technology that are developed indigenously. The equipment may not be costly, elaborate or hard to find but its use must be original.

To prosper in the emerging environment and contribute significantly to national security, the characteristics of the enterprise which are in the best position to create critical defence technologies will probably include the following:-

(a) The ultimate success of the Defence manufacturers depends on their domestic market – their most reliable source of contracts. However, in the present era of prohibitive costs of Defence equipment, economies of scale become important and thus exports can be of great value. In fact, in today's environment, where the state cannot be expected to sustain the private Defence industries, exports with controls on exportable technology would be inescapable to make them viable. Everyone, right from the policy makers, the Defence Services and other high technology users need to understand this. The stumbling block is the lack of clear enunciation of policy and hassle free issue of export licences in time.

(b) Defence firms must have strong linkages with civilian sectors both to subsidise their Defence operations and to be fully informed of the latest technical trends. Now that the engine of technical developments has shifted almost entirely to the civilian sector, ordnance factories and the like that depend mostly on Defence business with little or no in-built R and D may find it difficult to survive.

(c) The Defence enterprise must be highly diversified. Future systems will need technologies to be combined

from normally unrelated fields requiring producers to have mastered a wide spectrum of fields. Also the subsistence of sales volumes on a single narrow specialisation would not be enough.

(d) The corollary to diversification is flexibility. The best engineers and managers should not be tied down to long-term projects. This can be maintained in cadres assigned to various projects as in-house consultants but always ready for rapid reassignment when opportunities emerge.

(e) Defence firms must maintain excellent relations with national military leaders, especially those responsible for doctrine and operational planning as opposed to contacts with the various acquisition agencies alone. Both military planners and Defence technologists will have to be closely familiar with each other's needs and capabilities.

(f) Finally, future Defence firms will require substantial access to investment capital. They must not only be ready to shift people but also investment funds and find outside money. This requires it to be a structure that receives government grants or to facilitate long term borrowings.

PROCUREMENT REFORMS – A MISSION NEED APPROACH

A clear understanding of mission–needs and the point in the development cycle where these requirements stand is required. In this analysis, our data base must include national capabilities and not just the DRDO and the Defence PSU's.

The procurement reforms keeping in view the changed environment require a change from staff requirement approach to a mission need based approach wherein a "System of Systems" view is possible for the definition of a

technology plan with achievable milestones. System and sub-system specifications will no doubt be there but these would evolve as we proceed through the stages of various technology demonstrators to meet the mission needs. The present system largely takes a 'sub-system' or at best a 'system' view and the trial and acceptance stages are largely loaded towards meeting detailed technical specifications based on available commercial defence literature. Mission needs fulfillment should be the key to system acceptance. Mission needs in themselves should be identified as a direct result of continuing assessment of current and projected capabilities in the context of changing military threats and the National Defence Policy. The assessment would be concurrently conducted by the C-in-C's in the field, who have missions to execute, Service Headquarters, the COSC (Defence Planning Staff)/CDS and the office of the SA to RM. The deficiencies could result in a need to :-

(a) Change doctrine, tactics, training or organisation and should be tackled at the lowest competent levels.

(b) Overcome shortcomings in existing material by upgradations or design changes. These again should be tackled innovatively by the competent echelons.

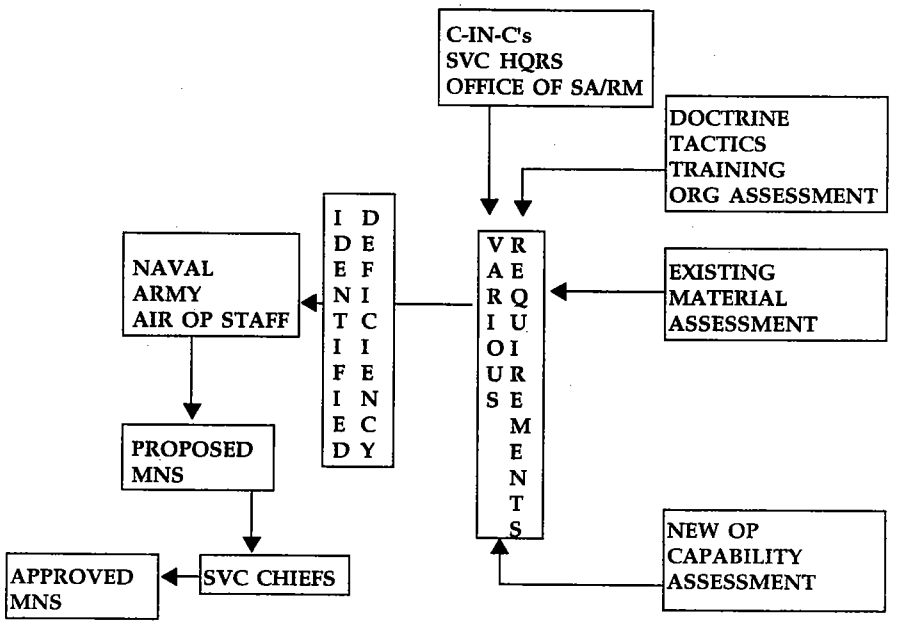
(c) Introduce new operational capabilities.

An identified deficiency that could potentially result in the establishment of a new acquisition programme should then be described in a Mission Need Statement (MNS). For identified Mission Needs, the statements could be prepared by the Service Headquarters and after due approval of the Service Chiefs, enter the Research, Development and Acquisition process.

After analysis, aspects of the Mission Needs may call for initiating basic research to build up the knowledge base and

guide the work of various research boards like the Naval Research Board. Where the technology required is available, but the system concept is not fully developed, an Advanced Concept Technology Demonstrator (ACTD) could be initiated in any of the laboratories of the DRDO/CSIR/Space/Atomic Energy or Industry but where or when both the technology and system concepts are fairly clear, an Advanced Technology Demonstrator (ATD) may be directly developed by the Industry (Public/Private Indian owned Company) with technology transfers from the laboratories as required, and after trials, quickly transitioned to operational systems. Herein the Department of Defence Production, DGQA and others will need considerable restructuring and downsizing. The proposed system for deriving the MNS and further Research, Development and Acquisition process is indicated in the table below :

TABLE I : FORMULATION OF MISSION NEED STATEMENT



Setting the 'Problem' in its correct perspective by the users thus requires a large "Intellectual Effort" especially at the higher service echelons and organisations like the Defence Procurement Agencies. Such intellectual effort in other countries is also provided by academic support at all echelons (tactical, operational and strategic levels) by specialist schools, various staff and war colleges and post graduate colleges, Command and General Staff Colleges, National Defence Universities, Industrial Colleges, etc. All these institutions have "Specialist Faculties" wherein the intellectual inputs come through research projects and studies in addition to conducting courses. Our whole training and educational system in the Armed Forces will need a revamp in this direction.

In addition, the missions today, in a number of areas, cut across the jurisdictional boundaries of the Service Headquarters and even organisations like the Coast Guard and the BSF at the functional levels and in their technological dimensions. Therefore, atleast within the Services, both the CDS structure and theatre commanders to plan, orchestrate and direct military campaigns within theatre of operations, need to be in place. Without such higher direction and campaign planning realistic MNS are unlikely to evolve, and further orchestration of forces within a campaign, which requires harmonious combination of capabilities to achieve a synergetic relationship, would not be achieved at optimum levels.

For Defence exports we need to have :-

(a) Products free from foreign export controls.

(b) These should be in our service.

(c) Should be exportable within our foreign and Defence policy framework.

(d) Be able to compete on the policy, product and financial framework in the country where we want to sell. Defence procurement all over the world is much more than just procuring the most relevant weapons at the cheapest rate.

In this I would say that state of the art is a very relative term – the important thing is a functionally relevant system, which is affordable and this should govern own procurement effort and that of the countries where we want to sell. Hankering after state of the art across the board is likely to make own procurement effort unaffordable and unexportable as it is largely 'bought out' with no more than transfer of manufacturing technology.

To sum up, in dealing with rapidly advancing technologies and the changed environment, the government and industry must be in partnership; with the government funding long term and high risk research with a view to nurturing technologies that hold military promise and ensuring interaction with and assisting industry that grows to exploit their dual-use (military and civil) and contribute to economic security (jobs, global competitiveness, favourable trade balance, etc.) – something that the Department of Space, and the DRDO to some extent, have done well. Such industries in turn will serve national security and will have intellectual rights over technology that underpin their products in additional infrastructure, production lines, experimental laboratories and communications that enable flexible reaction to new situations. It is only through such technologically capable industry that economic security and national security interaction shall result. Considerable industrial capability has been built in the country. Our economic policies should ensure that such industry remains in sovereign private sector control and that we liberally support this industry with R and D inputs especially basic

research. R and D without such industrial infrastructure and interaction would not pay much dividends. By importing non-strategic systems for defence, cautioned Dr Abdul Kalam, we will not be able to defend the economic freedom and national security as dependence on other nations will be a chain reaction. The country's strength in trying to protect its security and evolving an independent foreign policy is dependent on the degree to which the nation is able to underpin technology development in defence and defence systems. We have to recognise that technology is the toll that brings faster economic growth and needed inputs for national security. Successful experience of certain technological leaders reveal that we have to demand the impossible from our institutions – the possible will emerge.

THIRD SESSION : THIRD PAPER

LIEUTENANT GENERAL RIS KAHLON, PVSM, UYSM, AVSM (RETD)

Some 23 years ago, as a student at Command and General Staff College, Fort Leavenworth, USA, in my class for tactics I was asked, what came first, the Doctrine or the Weapon? My quick response, based on my experience with our army was the Weapon. Very soon into a brief discussion that followed, realisation dawned on me that there were nations who had the capacity to study a problem, enunciate the requisite doctrine and then proceed to develop, deploy and assimilate a weapon system(s) in a short time. Thus, their weapon systems were doctrine driven and not the other way around as was our experience.

These nations had the political will, technology, money and appropriate policies. Interface between military and civilian scientists as also the production units were in place and there were no barriers. Their national military capability was not limited to efforts of a few scientists tucked away in government controlled laboratories and establishments but grew through well thought out, collaborative and collective efforts of the industrial might of the entire nation.

The civil effort, which was, by far the major contributor to the national defence effort was sustained by fiscal allocations to defray developmental expenditure; regular orders from own armed forces and licenced sale to allies and foreign friendly countries - a decision that rested with the Government and through which it exercised control.

But let me hasten to add that even today there are no more than three countries, which are capable, and therefore fully meet their defence needs indigenously. These are the USA, Russia and France. There are many who are self-reliant and that indeed has been our own declared aim since we created Department of Defence Production and Supplies and

the DRDO. The earlier two sessions have covered in detail the existing system, its achievements and inadequacies and its interface with the civil industry.

I have been asked to address specifically, the need for collaboration and defence exports to make the defence industry viable and self-reliant. Simplistically speaking, the answer to both these is an unquestionable 'yes' but the moot point is; do we have what it takes to collaborate with those who have the requisite technical know how and economic strength to make the exercise worth the effort? Do we have the products that will readily sell to those who need them and at costs, which are renumerative? The answer once again in an unquestionable 'no'. In face of this harsh reality my presentation takes a purely academic tinge as my discussion is about nonexisting capabilities.

Collaboration in Defence Production

To collaborate is to 'work jointly', to share technology and capabilities, which would compliment each other's effort bringing about synergy. This presupposes shared interests and mutual confidence in each other's capabilities. In the field of defence, collaboration is only possible if the two partners share common political ideology and core values. All other factors, and there are many, play a second fiddle.

Soon after gaining our independence, we chose not to side with either of the existing power blocks in the world. Instead we forged a new grouping and spearheaded the Non Aligned Movement (NAM). How so ever laudable and appropriate that may have been from the national standpoint, in my view that killed any possibilities of collaborative defence production with any worthwhile partner. This effectively cut us off from the western world, which in my view was the only window for the issue in question.

As time went by we managed to forge a strong bilateral

relationship with the Soviet Union and ended up importing military hardware at terms and for reasons that need not be recounted to this audience. All this while we continued to be in the forefront of NAM movement and professed our neutrality from the roof top. The West, however, doubted our bonafides all through and branded us as Russian stooges while the Russians never quite counted us in their camp. I am neither a politician nor a student of politics and as such will not comment on the wisdom and merits or otherwise of our chosen path but our political posture effectively ruled out any possibility of collaboration in defence production with any meaningful power. None of the NAM countries had the ability to be a worthwhile partner nor could we, I dare say, have inspired any confidence in others. Even political linkages were never strong enough for any collaborative possibility in the field of Defence Production.

Besides, there are many other factors, which would impinge on decision making. Some of these are, state of economy, level of technological know-how, size of the market in mind and, above all, political will. Who would wish to collaborate with a nation which has had a substantial part of her population living below the poverty line devoid of basic facilities like drinking water? Upto the eighties we had not even produced a motor cycle engine; cars came in late nineties and our first deployable weapon system in shape of a 5.56 mm rifle came in 1997. With this level of technological know how and demonstrated capability we make a poor partner for anyone leave alone those from whom we could have benefited.

The only possibility for military cooperation is with Russia. The current state of the primacy enjoyed by the USA against which bolstering up of China and India, as strong regional powers could be an understandable Russian objective. This is where we can turn around our longstanding relationship with Russia into a mutually cooperative exercise. We have a rather large requirement to service the needs of

our armed forces. Our current equipment is of Russian origin. We have a declaration of Russian-Indian Strategic Partnership in place signed in October 2000. Can we build something tangible on it? I believe we can and we should.

Another partner with whom collaboration is not only possible but also a national imperative is the Indian industry. We do depend on foreign companies, why can't we depend on our own? We willingly make sizeable advances to foreign vendors with all orders, which makes it possible for them to rotate this money and manage their supply schedules accordingly. But we refuse to turn to Indian companies of repute even though they are prepared to offer bank guarantees for the advances and reduce cost of their product by as much as 20 to 25 percent. Besides this mind set, we will need to change the rules of business of the MoD and procedures that have for long served only one purpose– impede procurement and cooperation with own industry.

Defence Exports to Make Industry Viable

Defence hardware is expensive, needs constant upgrade and sizeable outlays towards R and D. Countries like the USA, Russia and France have perfected the art of ensuring very sizeable exports and huge earnings which are channeled into developing more and more sophisticated weapons. The state-of-the-art weapons are only made available to their own armed forces or very close allies while the older generation of weapons are sold out. This not only ensures first rate military capability for themselves but exercising of effective and meaningful control over a large number of countries which goes to serving their national interest. Recently, countries like South Africa and Israel too have made very sizeable arms deals even though they are not in the same league as the USA and Russia. Undeniably defence exports are the best way of sustaining defence production.

Our ability to undertake defence exports is unfortunately

quite dismal. Most of our production from aircraft to tank to frigates is licenced. We have not been able to absorb technology and work on successor generation equipment ourselves. When we come to that stage we once again follow the licenced production route. As such none of these weapons can be marketed by us.

An odd weapon system that we have managed to produce is so expensive that no one will pick it up at that price. Our Defence PSUs and Ordinance Factories are very benevolent employers and buyer of their products have to bear a very heavy burden of social costs that accrue on account of benevolent measures that abound. If exports are to support R and D and production costs then we need to sell at prices above our cost price. Some years ago an AK 47 could be purchased for $ 100 while our 5.56 mm rifle was costing us Rs 25,000 each.

There is, however, an area which may not be attractive but can be good business. We have good capacities and quality when it comes to items of general stores and clothing. There are fair quantities being exported to African and Latin American countries by civilian vendors. In my view we ought to make a beginning in an area which may neither be glamorous nor so lucrative.

I am not apologetic that my presentation is so negative. In an academic environment it is generally fashionable to sound positive or atleast make half a dozen suggestions that sound hopeful. I have deliberately not done that because I am convinced that until we demolish the existing structure completely and replace it with a new one nothing will come of it. Cosmetic changes will not do. There are too many vested interests so deeply entrenched that only radical changes can bring about hope. Are we capable of making those radical changes? The results of our recent post- Kargil exercises fill me with no hope.

DISCUSSANTS

Lieutenant General C K Kapur, PVSM, AVSM (RETD)

Some very useful points have emerged in the presentations, particularly at conceptual level regarding the collaboration as well as Defence exports for the improvement and self reliability of our Defence Industry. All the three learned speakers have clearly highlighted the problems regarding meaningful joint collaboration because of non-availability of indigenous state-of-the-art technology, lack of basic Defence-industrial infrastructure and our highly complex bureaucratic procedures. This itself is a major and positive recommendation because the proper understanding of the problem will force us to generate adequate responses if we are to make any worthwhile progress in these vital areas. The basic point which I would like to stress is that if we have not been able to do something in the past, it should not be construed as our inability to do it in future too. With globalisation and economic opening up, both in India and China, more changes have taken place during the last 10 to 15 years as compared to what happened in the first 30 to 35 years after our independence. Where there is a will, there is a way. The rules and regulations are made by us. When we want some changes, these can be brought about though there will be some difficulties. Regarding Defence industry and weapons production three basic aspects need reiteration which are :-

(a) Firstly, a nation needs a well developed indigenous industrial base and high grade infrastructure including scientific, technical and managerial skills for the growth and sustenance of the capital intensive Defence industry. Quality weapons production is not a poor man's hobby.

(b) Secondly, technology has always been important to warfare since times immemorial, but lately it has emerged

as the key source for a nation's well being and national security. There is no doubt that the armed forces of a nation that is stagnant in technology, would be relegated in terms of effectiveness, jeopardising in the process its security, sovereignty or even survival. At the global level, technology is taking long strides. You have to keep running even to remain static. The traditional 15 to 20 years weapons system development cycle from conceptualisation to fructification is too long a period and no longer acceptable. Hastening the development process is, therefore, a necessity.

(c) Thirdly, despite all the hype about globalisation and commercialisation, Defence industry is unlikely to become a 'normal' industry. Superiority in Defence technology gives a nation a vital military edge over other nations. The desire for self reliance regarding critical Defence products is a powerful survival instinct. Therefore, joint collaboration in Defence at national level is governed more by geo-strategic long term considerations than commercial or technological factors.

Global Trends

With this backdrop let us have a look at some of the trends in the Defence industry in the post-Cold War era. Global Defence/industrial landscape has changed with remarkable rapidity. This has been a period of consolidation, integration and amalgamation not only at the national but even at the international level. Amongst the developed countries who are major producers of arms, the belief is that big is better and the bigger is better still. This is partly a function of a shrinking Defence budget, high development costs and the competitiveness of the international market where North American and Western European companies

are clearly the dominant forces. In the latest ranking of the world's top 100 Defence companies, there are only two non-European and non-American Defence companies in the top 20 and nine in the top 50. Leaving aside Russia and China, whose published Defence data is not considered transparent enough, Japan and Israel have the largest Defence industrial sector. The recently evolved Russian-Chinese strategic partnership and their re-established Russian-Chinese Defence industry cooperation is likely to present a new challenge to the USA and European Defence companies particularly in the Asia-Pacific Region. It clearly emerges that the developing countries by themselves do not appear to inherit the Defence world. Strategic-technical partnership is the normal route for growth and development in this sector.

India's Options

Our approach to development of Defence industry has to be multi-dimensional. Weapons development and weapons export is a capital intensive and complex process. The decisions taken now will fructify sometime during the period 2010-2015. At the national level the issues regarding partnership between the Defence and civil industry, restructuring of Ordnance Factories and Defence PSUs, emphasis on the development of technologies that are required to serve joint Service promotion of dual use technology have already been laboured at length. The emphasis on the growth of generic as against specialised technology by involving civilian technology and R and D were used by Chinese with great success. Many old rules and procedures will have to be dismantled if the civilian industry has to function effectively in the Defence sector.

In the strategic areas we should endeavour for joint collaborations rather than licensed production with Russia. For example, SU-27 aircraft or LCA, could be produced in India with Russian help and thereafter marketed jointly. Most of our Defence equipment is of Russian origin. While

importing expensive weapon systems we are currently following a system of 'Counter Trade' wherein the foreign supplier has to import some products from India as an incentive. Such exports from us frequently go to Agro-industry. Instead of this we need to go for 'Offset Trade' where the foreign supplier of equipment is forced to purchase, say 20 per cent, of its components from us. Further, we have a rich reservoir of technical manpower. We need to explore the export of services in the fields of upgradation and overhauling of the Russian equipment in which we have the requisite expertise. This equipment is still in use in many of the countries in the Middle-East and South East Asia.

Israel and South Africa are the other two countries which have state-of-the-art technology in surveillance, UAV and ammunition. There is a good scope to collaborate with them. For example, we are planning to set up an explosives factory at Nalanda. This factory could be established with the help of either of these two countries with the exclusive rights for exports. These items are and will continue to remain in demand for a long time to come. The integration of commercially developed software, in which India has a pronounced edge, into Defence systems affords another good opportunity for collaboration with Israel.

I would like to conclude by reiterating that despite numerous failures in the development of various other systems like ALH and even Arjun Tanks, we have made tremendous success in the development of our missiles system. We certainly can draw some useful lessons from this success story. We can make a beginning from low-tech non-strategic areas and work upwards towards export of weapons through joint ventures with suitable foreign collaborators. India has a potential for the export of defence systems. What needs to be critically examined is how to make use of this potential, which requires political will, high grade technology and pragmatic rules and regulations.

Brigadier Subhash Kapila (Retd)

The first point that I wish to address is the imperatives. Self reliance is produced of vulnerabilities. India's national security requirements dictate the creation of an unassailable and credible military superiority in the region. This can only come about and be maintained if there is an element of self sustainability, i.e in terms of Defence expenditure it is to be borne by the earnings of the Defence exports. The Press predicts Defence spending to be in the range of $ 100 billion in the next fifteen years to build up Defence capabilities. This would be $ 7-10 billion a year. It is suggested in some quarters that if efforts are made in right earnest from now we could graduate to a figure of $ 5 bn onwards.

A point to be noted is that joint collaboration and Defence exports stand at the interface of India's foreign and defence policies, equations and attitudes. Success in both these activities depends heavily on external factors even after we streamline and restructure.

The speakers have already mentioned the construction of the global arms market. Apart from centralisation, the cause for it is also because many countries are entering into indigenous Defence production. Soon there will be an European Armament Agency, which would control all the dealings and goings on of member states of the EU. The luxury of plugging into one of them will not be there.

Our foreign policy needs major policy orientations in terms of strategic partnerships and relationships facilitating joint collaborations and Defence exports. The last one year itself has seen major countries like France, Israel and Germany showing interest. Unfortunately, the intense consultation, cooption, cooperation and integration of policy approaches between the MoD and the MEA is patchy. A total ruthless restructuring of India's Defence production set up and

delinking of this and Defence exports from the MoD in its entirety are required.

The aim of Defence exports is to attain self sustainability in creation of regional military security without a drag on the national exchequer. In the first tier you have the USA and Russia followed by China, France, UK, Germany, South Korea and even Singapore. Our existing Defence export potential is negligible. The MoD's Annual Report for the year 2000 speaks of Rs 190 crores. The existing organisational structures and policy making mechanisms are not geared for Defence exports. As per the Defence Industry Policy Resolution of 1991 only the final assembly of the legal weapon systems are reserved for the private sector. Therefore, the field is open for the private sector. If they were to come, management of exports cannot be done by any governmental structure. It is a business activity and beyond the capability of any public body. The private sector will have to be brought in a big way. Whatever product comes of the PSUs and OFs and can be targeted for exports, the private sector can act as a trading agent for those sales. Whatever it produces can come under direct sales and marketing. The private sector would require the DRDO and R and D support, military design support in terms of say the software and the know-how for the ruggedisation of equipment for battlefield operations. The institutional support from the MoD and MEA is also required.

Defence exports will have to be looked at bit more comprehensively. It should also include apart from weapons, equipment, materials, technical services, consultancies, repair, maintenance, even training. Defence exports are successful only if the buyer perceives that whatever is being offered is at the leading edge of performance and that there would be a good after sales back up regarding spares, and any other after sales service as required.

This country definitely needs a comprehensive national security policy document with guidelines not only for the Armed Forces but also for the Defence industry. All this arises from a considered deliberation about threat perceptions, national security interests, and long range Defence planning. From these arise the Force structure.

It is on the Force structure that your entire weapons and equipment policies will be determined. One wonders if in the Army especially there is a case for having different weapons and equipment policy for the strike formations and Defence formations. We may lose flexibility but then we have moved much ahead of that stage of having formations going only for multiple roles. This would enable one to have not only different levels of equipments and weapons but also in the allocation of that responsibility to the OFs and private sector.

It is time for India to move on to a comprehensive capacity building approach as opposed to a reactive approach determined by the threat perceptions arising out of threat scenarios emerging from China and Pakistan.

When one looks at both joint collaborations and Defence exports, one wonders who will be the natural ally in India for this sort of task? They will shy away from the ministerial structures and PSUs due to earlier experiences. The natural ally would be the private sector.

One would like to mention Nixon on bureaucracies when one ponders over the need for delinking this from the bureaucratic structures. He said that their "thinking is dominated by a curator's mentality. They treat current policy as if it were a museum piece to be preserved at all costs and they view a new idea as a mortal threat to their prized artifacts." We need to avoid falling into the bureaucratic trap.

GENERAL DISCUSSIONS

Air Marshal RC Bajpai, PVSM, AVSM (Retd)

On 23 August 2001, in reply to a question in the Lok Sabha, the Minister of State for Defence stated that the Defence industry is open for participation by Indian private sector subject to licensing permissions. This includes all types of Defence equipment; no item is exclusively reserved for the public sector". All items produced by the private sector will be sold only to the government or to the OFs, Defence public sector undertakings, except for exports.

Commander Patel

As a first step on our road to successful indigenisation and exports, can we first standardise the items within Service and inter Services through a Task Group dedicated to this goal? With my experience in the Navy, I feel that too much diversity exists due to various sources of procurement. This standardisation will help achieve economy of scales, reduce inventory, and concentration of effort for the R and D.

Vice Admiral Raman Puri, AVSM, VSM

I think it should be done, but then there are road blocks. Within the Service itself there are road blocks; inter Service there will be more.

Lieutenant General R I S Kahlon, PVSM, UYSM, AVSM (Retd)

There is in fact a Directorate of Standardisation as part of the DRDO headed by a Brigadier. He has a target set by the BSA every year. But there is only lip service. In the Principal Maintenance Officer's Committee that I chaired for a few years, where the AOM, COM and the NGO sit together, we did this many a time. There are in fact independent repair facilities in the three Services looking after their

own equipments; while the overall holding of the equipment is not adequate to be sent to the three different repair facilities.

Vice Admiral PJ Jacob, PVSM, AVSM, VSM (Retd)

There is indeed a need for standardisation to reduce inventory holdings which is massive with each Service just now. We do need a common procurement set up. This new procurement board may help change matters.

Major General S C Sinha, PVSM (Retd)

There have been many comments on the necessity for exports of Defence products for which price must be low. One thing that does not affect all this is the work culture. During our visit to China from the USI we were taken to a shipyard in Shanghai. It had a total strength of 20,000 workers of which 25 per cent were technicians and the rest labourers. The average pay was an approx equivalent of Rs 1200.00 in Indian money. They annually produced around 60 ships, some of which weighed around 60,000 tonnes. When queried by Admiral Govil, who was with us on the trip, as to how it compared with the Vizag shipyard, he mentioned its labour strength to be 5000 with lesser pay. And the output was one or two ships a year. The public sector work culture needs to be attended to.

Vice Admiral Raman Puri, AVSM, VSM

In the HAL Board meeting a turnover of a few thousand crores was declared. This turnover was only on the overhauls. If this turnover was carried out somewhere else what would be its cost to the customer? It would have been six to seven times more. Generalisation across the board is a very difficult thing to apply. On that turnover the profitability is around 250 crores. If the turnover is calculated at the cost at international levels the profitability and investments would be of a high order.

When Ford went to set up a joint venture in China on a 50-50 basis, China asserted that labour would be provided by China on condition of wage agreement that they, the Chinese, would sign; no individual was to sign this agreement. They agreed to provide the infrastructure, while the Ford's 50 per cent would mean cost of capital and technology. This was to be the costing for market access that Ford would be getting along with Chinese labour and land; hence China owned all land. Hence the costs of production are very different. It is very difficult to make comparisons.

We do want to reduce the labour in the dockyards but this will happen only over a period of time and not overnight as China is capable of doing.

Commander N Radhakrishnan, SC (Retd)

What does the equivalent of Rs 1200 mean? Approximately 70 per cent of the labourer's requirements are provided for by the State. This is what is meant when one says that the only rich man in China is China. They as a country are bearing the cost; it is not visible.

Vice Admiral Raman Puri, AVSM, VSM

This was the system in the former Soviet Union also. It could not be sustained and collapsed. So how long this will last in China is an open question.

Lieutenant General R I S Kahlon, PVSM, UYSM, AVSM, (Retd)

If one is to take the case of the vehicle factory at Jabalpur, it has 11,300 workers and 3000 or more workers in the foundry next door. They produce 2000 vehicles annually. In most of the OFs, it would be a great day for the management if the workers work for two hours. The work culture problem does exist in our OFs and PSUs. We are overloaded with manpower and as Vice Admiral Puri says, it will take time

in sorting out. What the Chinese do is that they do not go for any fresh recruitment in place of people who retire. It will take many years before the work force comes to a level that is actually needed.

Comment

During a visit by a team from the NDC to Bhilai when the CEO was asked as to what was the main problem, he mentioned that there were too many people. It was his opinion that production would rise with a reduction in the number of those employed, since much time is wasted in sorting out their personal problems.

Squadron Leader Nagpal

Import of Defence equipment helps users to have better reliability, maintainability and better technology equipment. Sometimes the cost would be less than that compared to indigenisation.

Air Marshal RC Bajpai, PVSM, AVSM (Retd)

We must have confidence in our own technology. In the technical branch of the Air Force in particular, we have qualified and well experienced people. As there are no private vendors so far, what comes are from the PSUs or the DRDO and the user is a party to that.

What we want is appropriate technology. When we go for an updation of our knowledge experience and so on, the question is – against what do we do this?

In the event of non-availability of an equipment or delay in projects and programmes one must take recourse to importing these, provided it is necessarily required.

As far as cost is concerned, the reasons for it being high has been stated earlier. It is the work culture. In this age of networking when people to people contact can be online, we notice groups coming from all places to Delhi for meetings and Conferences to discuss trivial matters.

Defence forces are the captive clients of PSUs.

Vice Admiral PJ Jacob, PVSM, AVSM, VSM (Retd)

It is all because the PSUs have not learnt how to compete in the market. However, it is hoped that things would improve in the future.

Major General Y K Gera (Retd)

What is the way to eradicate this malaise?

Vice Admiral PJ Jacob, PVSM, AVSM, VSM (Retd)

With the participation of the private sector, a competition is generated and the PSUs may behave better. There is a lot of hesitation amongst the PSUs for such privatisation. Today, even if a person is removed from the Depot, the Headquarters have to face the Union. This is the class which is affected by privatisation.

Brigadier Pradeep Mehta

Seminars are used to focus on macro-issues. There ought to be more of these Seminars at lower levels to develop structures to actually see the results on the ground and present possible inputs to the MoD for implementation. The question of Defence exports is not suitably understood or addressed. It is linked to our overall self reliance but the actual problems are not brought out.

Where the technology is home-grown, that itself will ensure an advantage for the country. 50 per cent of the cost of product purchased from outside is towards cost of technology. Our competitive advantage lies in using our brainpower to create our systems, despite inadequacies that exist in the system.

Vice Admiral Raman Puri, AVSM, VSM

In relation to what General Kahlon said about exporting what we generally produced under the revenue head, there

are a whole range of these items being produced by us which are useful for the Middle East; and we are fairly good competitors in that region.

Colonel Mahinder Kumar

One of the basic problems with Defence industry is the mismatch between the R and D and production. Once a product is developed and handed over for production, inhouse development of the product thereafter is totally lacking. That is the starting point from where the product must mature. The production agency, subsequently, must add to the various models for further use and exports. However, as far as exports go, flexibility is lacking in attending to what a customer wants.

Lieutenant General Chandra Shekhar, PVSM, AVSM (Retd)

In Israel, there is total synergy between research, manufacturing agency and the user. This helps them to produce systems that are state-of-the-art. Wherever we have this synergy, we have been successful. An instance is the ALH radar, plan AREN equipment and so on.

Brigadier Pradeep Mehta

Is there a need to have an umbrella organisation akin to the arms corps in South Africa and place all of Defence industries under it to overcome empire building?

Lieutenant General RIS Kahlon, PVSM, UYSM, AVSM (Retd)

My knowledge of the South African organisation that you mention is nil. What we need is to effect coordination and transfer of technology from one to the other.

The Navy, being a smaller Service, its experience with the DRDO and so on, is different and positive. It is well integrated, their budget is more in capital and less in revenue.

The Army is just the opposite. The MoD literally makes the three Services antagonistic to each other.

Unfortunately, when we deal with the Ministries and the PSUs, we cannot achieve much due to lack of continuity due to short tenures. In the MoD your have people doing the same jobs for long thereby providing continuity.

Major General Ian Cardozo, AVSM, SM (Retd)

If is unfortunate that there are pessimistic vibrations emanating from the serving and retired officers who state that the system cannot be defeated, who speak of vested interests; turfs to protect, empire building and so on. One must fashion out a strategy to make Service HQs work. There is a need for will to make it work. It is not clear how the hierarchy will bury their differences in national interest. The other problem is the rigidity of military hierarchy, whereby subordinates are not given an ear; and the uniformed fraternity cannot speak because of the system. The ones who are not shackled by restraint are those out of uniform. We can take up the matter, bury our differences and work in the interest of the nation.

CLOSING REMARKS

Lieutenant General KK Hazari, PVSM, AVSM (Retd)

There are some conceptual issues that one must bear in mind. When India became independent, the organisation, systems and procedures were there but we hardly had a base from which to start. The dilemma was, who could do the job for which we were setting up these organisations. It is now more than five decades. Things have moved forward, but no attempts have been made for a progressive change. A review of our requirements should have been made. It is only now, after a gap of so many years that we are attempting to see what changes need to be made to move faster towards progress. What was lost over the years, maybe a part of it can be achieved.

The first aspect regarding R and D and development process, is the planning itself. This has been defective from the very beginning. The R and D is to serve a purpose. That purpose is the operational requirements of the Armed Forces. Defence R and D technology must be driven by user requirement. This necessitates a clarity on military objectives, military strategy, the force structure, force mixes, weapons mixes, equipment mixes in order to achieve the tasking that is visualised for the Services. Take the pre Kargil situation for instance. Insurgency struck the state of J and K in 1989. Yet, for a decade, no planning or analysis was done to determine the type of technology, weapon systems and equipment required to deal with this malaise.

It took the Kargil conflict to activate such an assessment of requirements to counter the onslaught. It should have been done sooner to have proper systems and procedures for evaluating requirements and setting out tasks for the R and D and for all other agencies. There have been some rectifications in this regard in recent times, but it is not adequate.

The second feature to consider is the faulty regulatory procedures and management systems adopted in the country with regard to R and D, the transfer to technology, and production and supply of product to the Services.

The R and D has by and large taken its own decisions on the technologies to be developed. There is minimal discussion with the user and very little corelationship with what the user requires in relation to the operational tasks. That is the reason why it has gone at a tangent quite often. There is no overseeing authority. This of course does not exist for the intelligence services either. There is no regulatory authority to ensure that tasks are set out based on some requirements that national security demands. It is hoped that matters would be settled with the setting up of the R and D Council.

The other problem facing the R and D is the overall management practices and management systems. This has, contrary to certain opinions expressed in this seminar, nothing to do with the size of the three Services. When enquired about how the Navy inherited a system in which the R and D functioned under the Naval Headquarters, something that does not apply to the Army and the Air Force, the response was that this was a legacy of the British Navy. This is the system existing in the US too.

What began as a separate R and D, as regards the Army and the Air Force due to prevalent conditions then, has continued as such. In my opinion, the R and D, the DRDO as it is today, should have been organisationally split - the basic research and product related research with the latter having greater participation from user Services, based more on manufacturing units and less on R and D labs/ establishment. Some sort of organisational structure should have been created by which management of R and D dealing with product research came in synergy with user requirements and under the user's comfort in one form or

the other. In the absence of greater user participation, there is very little scope for achieving quick results.

In this country, a culture of having case studies is absent. An example to illustrate this is the MBT (Main Battle Tank). In 1980, at a meeting in the SA to RM's office regarding MBT, I had suggested a more active involvement of the user in the management of the project. This never happened. As Vice Chief of the Army Staff in 1986, I was heading the Army contingent in the Steering Committee for MBT. The laboratory heads gave their presentation there and each one mentioned where they encountered a block in their work because of lack of user inputs. In many areas, they had already gone far beyond the point where user input would be incorporated to bring in any meaningful change in what had already been done. Later, in a matter of two months, a management team was created at the Army HQ. It is still there and gives inputs to move the project forward.

Some of the points mentioned in the presentation by Vice Admiral Raman Puri demand reiteration. The real crux lies in manufacture. And one moves forward and backwards from this core. R and D must be linked to manufacture. Success of the product with the user is also related to the manufacturing unit.

Unfortunately, the R and D is placed at the core and the rest is peripheral. This causes problems.

Unless product development is closely linked to the manufacturing unit, be it under them or linked to them in some other manner, development, transfer of technology, and production will face problems. And in this cycle of integrated system, the user must figure prominently. In the US, wherever onus of development is unloaded on the private sector, the product management team is headed by the user. R and D is one of the many parts of it.

Cases vary but unless a system is evolved, production will not progress in the right direction.

One of the areas where the R and D has seriously gone wrong is that they set their goals too high from the beginning itself. They wished to build complex systems which took decades to mature in other countries without the capability to develop basic subsystems and components. This is the case with MBT and certain other projects. Ambitions should be within one's capability. This aspect applies as much to the user as to R and D.

One must also learn to rationalise where one has to do with things that are second best. Else, it may so happen that in our efforts to get the best, one may get nothing. The best is the enemy of the good; and this is a factor in the armed forces. Even where the best in required, one does not require the entire range of equipment, for the entire force, which is of the same quality. There has to be a differentiation between priority formations, priority fighting units and others. One has to assess the levels of equipment as is relevant to the requirement of the type of use you want to put it to.

In 1979, when I came to Army HQ as DGWE (Director General Weapons and Equipment), I came across a mammoth project which was termed the new family of vehicles. A study had been carried out in 1971 and finalised in 1974 on this aspect. The idea was to equip the entire Army with six wheeled vehicles and eight wheeled vehicles for certain uses. These vehicles were to be developed *ab initio* by the R and D. For this, huge task forces were set up in the R and D, they toured round the world for three to four years and began working on producing these vehicles.

In 1979, some development had taken place, a couple of prototypes had been shown which failed and were not acceptable in the form in which they were given.

The four wheeled vehicles performed better than the vehicles used in the 50s and the 60s. There were industries in the country that already had production lines to produce these vehicles. If new production lines were to be set up, it would require an investment of nothing less than Rs 3000-4000 crore to set up green-field units.

Despite repeated efforts during my three years of tenure as DGWE, I could not get anyone to change this thinking. It was only when the Army was faced with a shortage of 20,000 to 30,000 vehicles and had no option but to look to these industries to keep the Army on road, that such thinking died a natural death.

The impression I gathered from the discussions here is that we are somehow not looking at private industry as catering for Defence production needs on a long term basis. If private industry has to be involved as Major General DN Khurana mentioned, it has got to be on the basis of long-term partnership. One has to assess as to what it can do over the years. The initial years of involvement will give a limited output. One has to move to the next stage where certain full equipments can be taken on by the private industries. There are certain low and medium technology areas which must be identified.

Regarding small arms factory, it will require complete retraining of different kind of manpower as distinct from the earlier systems. The question is why not select a major private sector company which will be prepared to do this job? If they were to set up a unit, given a ten year guarantee of orders and were to produce weapon systems at an agreed price it will enable the forces to involve the private sector and also enable creation of a nucleus in the private sector that will subsequently develop weapon systems and even export them.

When this idea was mooted to the SA to the RM (Dr Arunachalam), he agreed in principle but maintained that it could not be taken away from the Ordnance Board.

Apart from small arms, there is scope for progressive involvement of private sector in medium technology and low technology armaments and equipments of that nature. Over the years their capability would increase to take on bigger challenges. The private sector has to gradually make its way up and not start with major projects leading to conclusions of their inability to handle it.

We have had some very useful discussions. Such discussions are fundamental to spreading knowledge and creating an environment based on which future progress can take place. No work is wasted. As a member of Committee for Defence Expenditure under Arun Singh in early 1980s, a comprehensive report on R and D was made. Though it did not go for wider circulation and was commented upon as a waste of efforts, in my opinion, the effort had been made, all material for reference was provided for and proposals formulated after research. I had stated that a time would come, created by circumstances, when this report would be useful. It has happened. The changes that are occurring are the fruits of efforts put in then. Hence, no effort is wasted. It just takes time to materialise. We have to put up with it and move things forward.

VOTE OF THANKS

MAJOR GENERAL YK GERA (RETD)
DEPUTY DIRECTOR AND EDITOR, USI

I take this opportunity, on behalf of the USI, to thank the participants in this seminar on both days, for making this seminar a success. I specially wish to express my appreciation to Lieutenant General SS Apte who accepted our request to present a paper at a very short notice. I would also like to thank Lieutenant General KK Hazari for his closing address and for having attended all the three sessions. He was thus aware of what went on in all the three sessions of the Seminar. In the process, during the Seminar, he has educated us. I have drawn on his time considerably, even while making the approach paper.

I thank the Director of the USI for guidance in the conduct of this annual event. Due to official commitments, he is not present here to participate in the Seminar. I extend my gratitude to the staff of the USI, in particular to Colonel VK Singh and Colonel Mahinder Kumar who have worked so untiringly to make this event a success.